Dome® CXtra™

User's Guide

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What's New in Version 6.x Series

Dome Display

Support has been added for the new Dome E2cHB display, a 2-megapixel, color, high-bright unit.

Windows Platform Support

Support is available for the Microsoft Windows 7 (x86 or x64) and Windows Server 2008 R2 (x64 only) operating systems.

Support for the Microsoft Windows XP x64 operating system was added to the Dome® CXtra™ 6.x series in an earlier version.

CXtra Utilities

Users can start, restart, and stop all CXtra services and application, and run CXtradiag with utilities. Access the tools via the Windows Start menu.

NOTE: Windows administrator privilege is required to run the utilities. Users without privilege must enter an authorized username and password as prompted.

Fast User Switching

The Fast User Switching feature is not supported on display systems using NVIDIA drivers previous to version 197.03.

Installation Upgrades

The installation procedure for Dome CXtra is now simpler, faster, and more reliable. All services and features are installed by default. To customize your installation, you must deselect the service or application feature you do not wish to install.

White Level Calibration

Correction of the display white level can now be done via manual conformance testing or with the White Level Calibration service.

A one-time, end-user calibration of the white level may be necessary when the target luminance is outside the tolerance established for proper display conformance, such as when the white level of a display has failed a manual conformance test, or when two or more displays in a multi-unit configuration show disparate white levels. An external photometer is required.

NOTE: Privileged users and administrators can calibrate the white level if a display fails the White Level test during the manual conformance testing. Only administrators can calibrate the white level via the White Level Calibration service.

Support for 10-Bit Displays

You can now run the Dome CXtra software on Dome 10-bit grayscale displays. You can check for 10-bit capability (both current and maximum supported) on the Properties tab of the Reporting dialog. You can also view 10-bit patterns (horizontal ramp and vertical ramp test patterns) using the Test Patterns service. And in manual conformance testing, you can take all 1024 measurements for more precise testing results.

Using Dome CXtra with Dome Dashboard

For best practice of using Dome Cxtra 6.x with Dome Dashboard 2.x, observe the following requirement and recommendation.

- When using Dome Dashboard 2.x, make sure that Dome CXtra 6.x or later is installed on each CXtra workstation.
- On the CXtra workstation, limit the retention of history to 365 days (one year).

Single Dome CXtra Package

The separate packaging of the Enterprise Management Service has been discarded. All Dome CXtra services, including the Enterprise Management Service, are now available in a single CD package.

Getting Started

The Dome CXtra software adds essential functionality to Dome medical imaging display systems in diagnostic and referral settings. By using the Dome CXtra suite of value-added services, you can calibrate and maintain displays, run acceptance tests, and monitor displays remotely. While the services operate as independent plug-ins, they each use the Reporting service for listing properties, logging events, and saving history.

Display Compatibility

Dome CXtra services enhance the functionality of these display systems:

- Dome CX
- Dome EX
- Dome QX
- GX2MP
- Select Desktops

You can also install the Dome CXtra software on systems using third-party commodity monitors to enable DICOM calibration. See "Enabling DICOM Calibration on Third-Party Monitors" on page 53.

NOTE: When you add or remove displays on the Windows desktop, you must restart the Dome CXtra software by rebooting the system. (Refer to ReadMe file for more information.)

WARNING: When the Dome CXtra application is running on the system, power off the workstation before you either connect a DVI cable to or disconnect a cable from the Dome display. Connecting or disconnecting a DVI cable with the workstation power on may corrupt the display EDID data.

Dome CXtra Services

The following services constitute the Dome CXtra software.

RightLight™ – Assures backlight stabilization for your display panel, calibrates your panel to the DICOM Grayscale Standard Display Function, automatically tests the calibration for conformance, allows manual conformance testing, and supports DICOM calibration at various color coordinates on Dome EX color displays. (Manual conformance testing requires the LCD or the LCD II photometer. Use only the LCD II photometer with Dome EX color displays.)

White Level Calibration – For displays using the RightLight service, calibrates the display photometer that stabilizes the white level. (Calibration of the white level requires the LCD or the LCD II photometer. Use only the LCD II photometer with Dome EX color displays.)

DICal™ – Calibrates your display panel to the DICOM Grayscale Standard Display Function, tests the calibration for conformance, and allows the selection of individual displays to run the service at any given time. (Custom calibration and manual conformance testing require the LCD or LCD II photometer.)

Backlight Saver – Extends the clinical life of your display by turning off panel backlights during periods of inactivity you define.

Test Patterns – Provides test images and allows use of custom test patterns for demonstrating and evaluating the performance of your display.

AAPM TG18 – Performs flat panel evaluations recommended by the American Association of Physicists in Medicine, Task Group 18.

DIN Test – Tests your display for compliance with German standard DIN 6868-57.

Privilege – Password-protects operating parameters of the display system.

Reporting – Collects, displays, and prints configuration data, characteristics, and event logs created by most other services.

Enterprise Management – Manages displays from a central location. Requires SNMP console (not provided) for remote viewing.

The use of Dome CXtra services is display-dependent. Check the following table for display compatibility by service:

Service	Dome CX	Dome EX	Dome QX	GX2MP	Select Desktop
RightLight	✓	✓			
White Level Calibration*	✓	✓			
DICal			✓	✓	✓
Backlight Saver	✓	✓	✓	✓	✓
Test Patterns	✓	✓	✓	✓	✓
AAPM TG18	✓	✓	✓		
DIN Test	✓	✓	✓		
Privilege	✓	✓	✓	✓	✓
Reporting	✓	✓	✓	✓	✓
Enterprise Management	✓	✓	✓	✓	✓

* Restoration of factory White Level calibration available only on Dome E2, Dome E3, Dome E3c, Dome E3cHB, and Dome E5 displays.

System Requirements

The Dome CXtra software requires one of these operating systems:

- Windows 7 (x86 or x64)
- Windows Server 2008 R2 (x64 only)
- Windows XP Professional (x86 or x64), Service Pack 3

Installing the Dome CXtra Software

NOTE: Install the Dome CXtra software to a local disk drive only. The software may not work properly if any components are installed on a network drive.

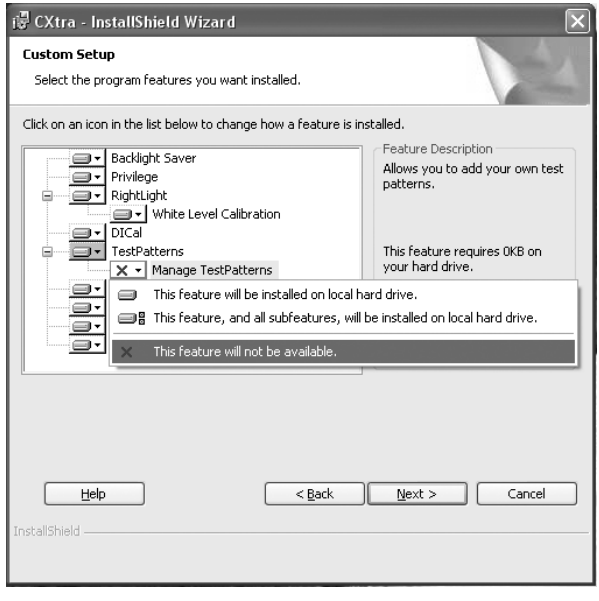
To install the Dome CXtra software

1 Log onto Windows with administrator privileges.

2 Insert the installation CD and run setup.exe.

3 Follow the wizard instructions to complete the installation.

FIRST-TIME INSTALLATION: By default, all services are selected for installation. To customize your installation, deselect the services you do not wish to install.


CXtra - InstallShield Wizard
Custom Setup
Select the program features you want installed.
Click on an icon in the list below to change how a feature is installed.
Backlight Saver
Privilege
RightLight
White Level Calibration
DICal
TestPatterns
Manage TestPatterns
Feature Description
Allows you to add your own test patterns.
This feature requires 0KB on your hard drive.
This feature will be installed on local hard drive.
This feature, and all subfeatures, will be installed on local hard drive.
This feature will not be available.
Help
< Back
Next >
Cancel
InstallShield

UPGRADE INSTALLATION: To upgrade to package 6.0.1 or later, insert the installation CD and run setup.exe. Follow the wizard instructions to complete the installation. Services that have been modified since the previous release are upgraded.

The application starts when the installation is finished. The Dome CXtra icon appears on the Windows taskbar. The check mark indicates that the application is running successfully.

Installing or Removing Services

You can add a service individually if you do not install it during the initial installation. You can also delete a single service as necessary.

To install or remove an individual service

1 Log onto Windows with administrator privileges.

2 Insert the installation CD and run setup.exe.

3 Follow the wizard instructions to the Modify, Repair, or Remove dialog.

4 Select and deselect the service to be installed or removed.

5 Follow the wizard instructions to complete the installation or remove the service.

Installing the Photometer

To use the RightLight and DICal custom calibration and conformance test features, you must purchase and install the optional LCD or LCD II photometer. (Only the LCD II photometer is RoHS complaint.)

NOTE: The LCD II photometer is required for use with Dome EX color displays.

Use the following instructions to install the photometer correctly per your operating system.

To install the photometer on Windows 7/Windows Server 2008 R2

1 Log onto Windows with administrator privileges.

2 Plug the photometer into an available USB slots on the system.

3 Go to the Control Panel and select System and Security. Next, select System from the options. Then, on the next screen, select Device Manager in the left pane.

4 In the Device Manager dialog, expand Other device. Right-click on the Calibrator node, and select Update Driver Software.

5 In the Update Driver Software dialog, select Browse my computer for driver software, and browse to <cxtra install directory>\USBx64Driver for 64-bit operating systems. Or, browse to <cxtra install directory>\USBDriver for 32-bit operating systems.

6 Click Next to start the driver installation. When finished, close the dialog to use the photometer.

Note the following:

- The Device Manager can also be launched by running devmgmt.msc.
- Default <cxtra install directory> on the 32-bit operating system is C:\Program Files\NDSsi\CXtra.
- Default <cxtra install directory> on the 64-bit operating system is C:\Program Files (x86)\NDSsi\CXtra.

To install the photometer on Windows XP

1 Log onto Windows with administrator privileges.

2 If necessary, install the Dome CXtra software. (See page 6.)

3 Connect the photometer to a USB port on the computer.

The operating system detects the new hardware and opens the Found New Hardware Wizard.

NOTE: If you connect the photometer to a USB hub and the Found New Hardware Wizard does not appear, connect the photometer directly to a USB port on the computer.

4 Follow the wizard instructions until a window prompts you to select a driver for the device.

5 Select Search for a suitable driver for my device and click Next.

6 Select Specify a location and click Next.

7 Navigate to the folder on your hard drive containing the photometer driver. If you accepted the default location during installation, the driver is stored in this folder: C:\Program Files\NDSsi\CXtra\USBDriver

8 Click Next to install the driver.

9 Click Finish to complete the installation.

Starting Dome CXtra

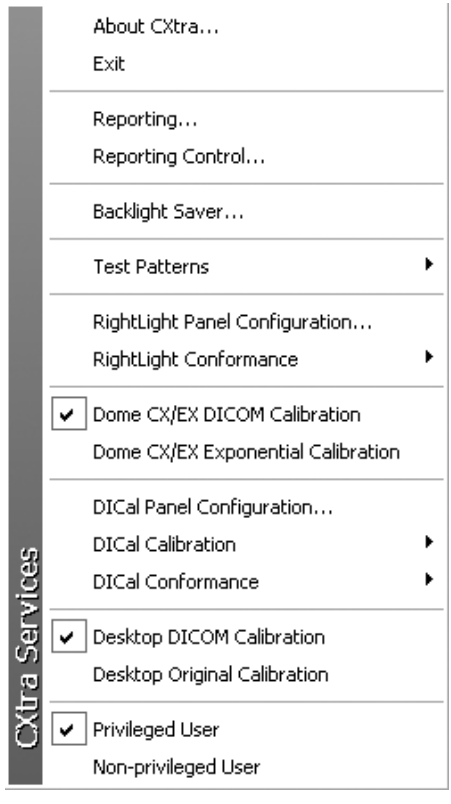
The Dome CXtra application starts automatically when you run your computer. If you exit the application or if it stops running for any reason, restart it by selecting Windows Start > All Programs > NDSsi > CXtra.

A Dome CXtra status icon appears on the Windows taskbar to indicate application status. The Success icon shows that the display is operating normally. The Wait icon appears the application is starting up or restarting from a stop. If the Warning or System Error icon appears, check the History tab in the Reporting service and troubleshoot the error. See “Reporting Service” on page 98 for detailed information.

Dome CXtra Icon	Status
	Success
	Wait
	Warning
	System Error

Opening the Dome CXtra Services Menu

All Dome CXtra functions are accessible from the services menu. This graphic shows the default menu entries for standard services.



To open the menu, click the Dome CXtra icon on the Windows taskbar. If the Dome CXtra icon is not visible on the Windows taskbar, open the menu by Windows Start > All Programs > NDSsi > CXtra.

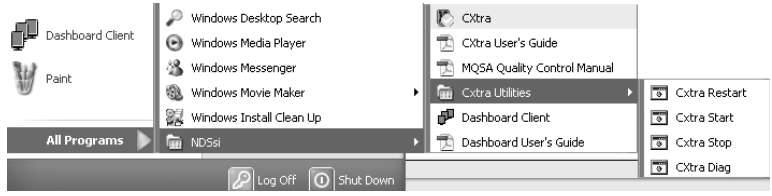
The menu is expanded to show the White Level Calibration service when the user is logged on as administrator. For more information, see "White Level Calibration Service" on page 35 and "Logging On as Privileged User/Administrator" on page 96.

CXtra Utilities

The following utilities have been added to the application.

CXtra Start	Launch the application and all CXtra services
CXtra Diag	Create Cxtradiag package
CXtra Restart	Resume application operation and all CXtra services
CXtra Stop	Terminate the application and all CXtra services

To access a utility, click Windows Start > All Programs > NDSsi > CXtra Utilities, then select one of the four options.



NOTE: Windows administrator privilege is required to run the utilities. Users without privilege must enter an authorized username and password as prompted.

Exiting Dome CXtra

If you need to exit (close) the application, open the Dome CXtra Services menu and select Exit.

NOTE: Exiting from Dome CXtra may require a password. See “Privilege Service” on page 96 for more information.

Uninstalling Dome CXtra

Use this procedure to uninstall the entire Dome CXtra application.

To uninstall the entire application

1 Log onto Windows with administrator privileges.

2 Select Windows Start > Settings > Control Panel > Add/Remove Programs to view a list of installed applications.

3 To uninstall the entire application, select CXtra.

4 Click Change/Remove to start the uninstall process. A message prompts you to restart the computer.

RightLight Service

The RightLight service performs backlight stabilization, DICOM calibration, and automatic and manual conformance testing for Dome CX and Dome EX displays. With RightLight, you can set a target white level, equalize the black level across the displays, set a desired response function, and specify ambient light in the viewing area. This service also reports current white and black levels.

RightLight automatically calibrates the displays at regular intervals. Calibration adjusts the response of a display to conform to the response function you specify. There are four calibration response functions, one of which is a correction to the DICOM Grayscale Standard Display Function.

DICOM calibration is based on the unique characteristic curve stored in each display at the time of manufacturing. RightLight routinely checks how well each display conforms to the DICOM standard and calculates a Luminance Uniformity Metric (LUM) value that indicates the degree of conformance.

Besides the automatic conformance testing that RightLight performs regularly, you can perform manual conformance testing as desired, using an optional external photometer.

You can also calibrate the internal RightLight photometer to generate a new calibration data file whenever the white level is outside the tolerances set for the display configuration. Calibrating the white level requires an external photometer.

For Dome E2c, Dome E3c, Dome E3cHB, and Dome E4c displays, you can set color coordinates for panel appearance in one of two ways:

- Select an option for panel appearance with blue, clear, or default.
- Use the LCD II photometer to perform color calibration when you specify color coordinates by color temperature (Kelvin scale) or by CIE xy coordinates.

Configuring the RightLight Service

If the Privilege service has been installed, you must log on as a privileged user to change the RightLight configuration. (See page 96.)

To configure the RightLight service

1 Open the Dome CXtra Services menu and select RightLight Panel Configuration. The RightLight Panel Configuration dialog appears with these tabs:
   - Backlight
   - Calibration
   - Ambient
   - Color
   - Auto (Conformance) Alerts
   - Manual (Conformance) Alerts
2 Check the selection box for each display you want to configure, or click Select All.
3 Select a tab and change the settings as described in the following sections. Click Apply to activate the changes without closing the dialog; click OK to activate the changes and close the dialog.

Backlight tab

For displays selected, you can view the values of these parameters:

- Black level in cd/m^2
- White level in cd/m^2
- Backlight use in hours
- Brightness as a percentage of maximum effective brightness

In the White Level field, type the target white level value (in cd/m^2) or use the arrow keys to change the value shown. Click Apply or OK.

NOTE: White Level values are limited to the upper and lower ranges specified per display.

RightLight stabilizes the backlights of the selected displays to attain the target white level. The system may require a few moments for the white level to stabilize after adjustment. This table shows the default target white levels for each type of Dome CX and Dome EX display.

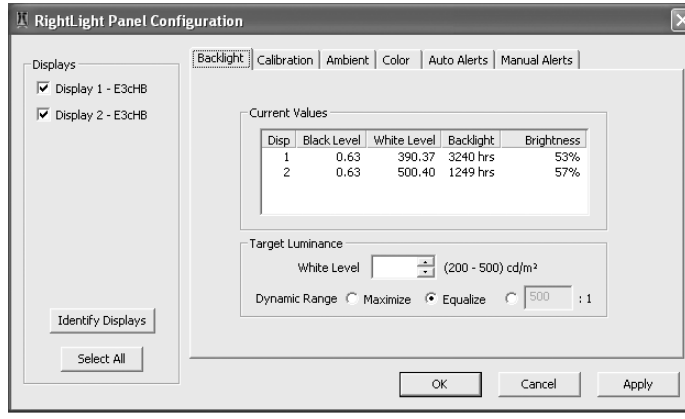
Display	Default Target White Level
Dome C2	600 cd/m^2
Dome C3	600 cd/m^2
Dome C3i	600 cd/m^2
Dome C5	400 cd/m^2
Dome C5i	500 cd/m^2
Dome E2	600 cd/m^2
Dome E2c	400 cd/m^2
Dome E2cHB	500 cd/m^2
Dome E3	600 cd/m^2
Dome E3c	300 cd/m^2
Dome E3cHB	500 cd/m^2
Dome E4c	250 cd/m^2
Dome E5	500 cd/m^2

NOTE: If you set the white level too close to the maximum brightness capability of the display, frequent warnings about high white levels may appear. To correct this problem, reduce the white level setting on the Backlight tab until the warnings stop appearing or use the Reporting Control dialog to disable the warning popups.

Dome CXtra gives you three options for controlling dynamic range of displays.

- Maximize - Causes each selected display to be calibrated using its full dynamic range. The dynamic range of the selected displays may differ.
- Equalize - Causes all selected displays to be calibrated using the same dynamic range. The system locates the selected display that has the smallest dynamic range and adjusts the dynamic range of the other selected displays to match it.
- Specify - Causes all selected displays to be calibrated using the specified dynamic range. The system notifies you if any of the selected displays cannot achieve the specified dynamic range.

If all the selected displays have similar dynamic range, there may be little or no visual difference among the selections.



The black levels and white levels shown on the Backlight tab include the ambient light level specified on the Ambient tab.

NOTE: Choosing the Native or the No RightLight Calibration option on the Calibration tab or on the services menu prevents RightLight from equalizing black levels. When you do this, you are no longer applying DICOM calibration.

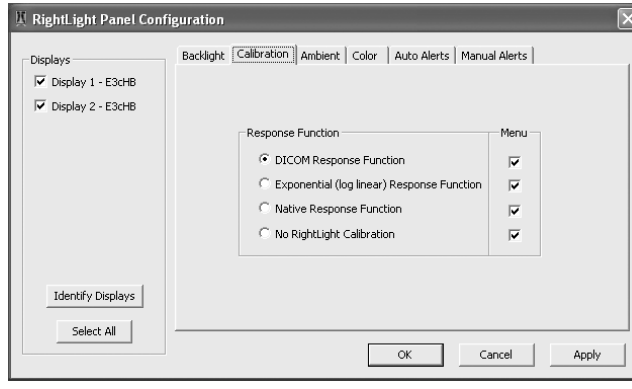
Calibration tab

Select one of these response functions for auto-calibration:

- DICOM Response Function (default) – Calibrates to the DICOM Grayscale Standard Display Function. See DICOM PS 3.14-2000 (Digital Imaging and Communications in Medicine (DICOM), Part 14: Grayscale Standard Display Function).
- Exponential (log linear) Response Function – Calibrates to an exponential (log linear) response function. The logarithm of the luminance is a linear function of the digital driving level.
- Native Response Function – Automatically sets the flat panel to its native response function (characteristic curve). The characteristic curve is the response function of the panel with no calibration applied. This is the display function created by loading a linear gamma correction table, or GCT.
- No RightLight Calibration – Turns off auto-calibration. Choose this response function if you are using an external calibration product such as the Dome Calibration TQA™ system. Dome CXtra retains GCTs currently set or created by an external calibration. RightLight stabilizes the backlights only.

CAUTION: Do not calibrate with an external calibration product, such as the Dome Calibration TQA system, unless your response function is set to No RightLight Calibration. Otherwise, RightLight overwrites the gamma correction table.

Check the selection box for each function you want to place on the services menu, then change the operating parameter via the menu.



Ambient tab

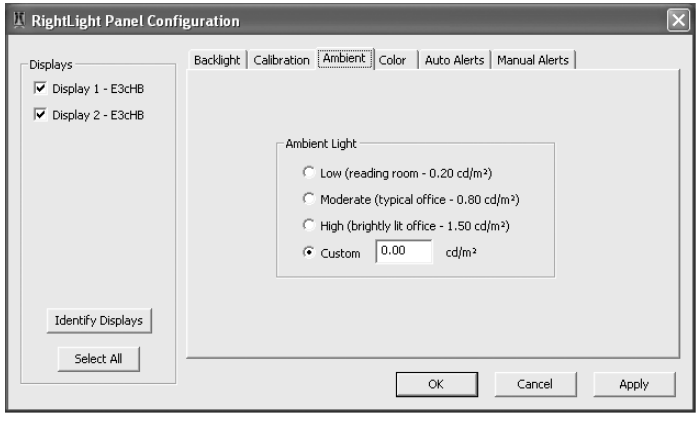
Specify the ambient light in the viewing area. Select the ambient light description that best fits the display location:

- Low (reading room - 0.20 cd/m^2)
- Moderate (typical office - 0.80 cd/m^2)
- High (brightly lit office - 1.50 cd/m^2)
- Custom – Fill in a value ranging from 0.00 (default) to 5.00 cd/m^2.

The RightLight service allows you to enter luminance in cd/m^2 resulting from the diffuse reflection of ambient illuminance. Since typical Dome panels have a reflectance of 1.25%, given illuminance E in lux, you can calculate the luminance in cd/m^2 using this equation:

$$\text{luminance} = 1.25\% \times E / \pi$$

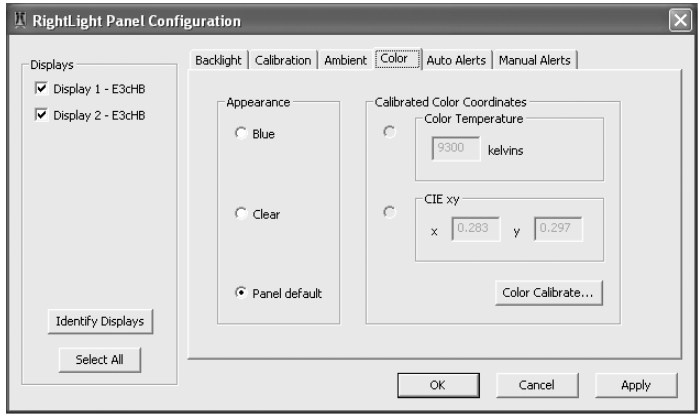
The default values are typical of reading rooms (approx. 50 lux), moderately bright offices (approx. 200 lux), and brightly lit offices (approx. 375 lux).



NOTE: Choosing the Native or the No RightLight Calibration option on the Calibration tab or on the services menu prevents RightLight from correcting for ambient light. When you do this, you are no longer applying DICOM calibration.

Color tab

Specify the panel appearance of Dome E2c, Dome E2cHB, Dome E3c, Dome E3cHB, and Dome E4c displays, with or without calibration.



Appearance. Use options in the Appearance field to specify blue, clear, or default when you do not color-calibrate the display panel.

Calibrated color coordinates. Use options in the Calibrated Color Coordinates field for precise specification of color coordinates. Apply this method, for example, with multiple displays when a discrepancy appears in color matching after you have selected an option in the Appearance field.

First, click Color Calibrate to run the calibration wizard.

Next, test and accept the calibration.

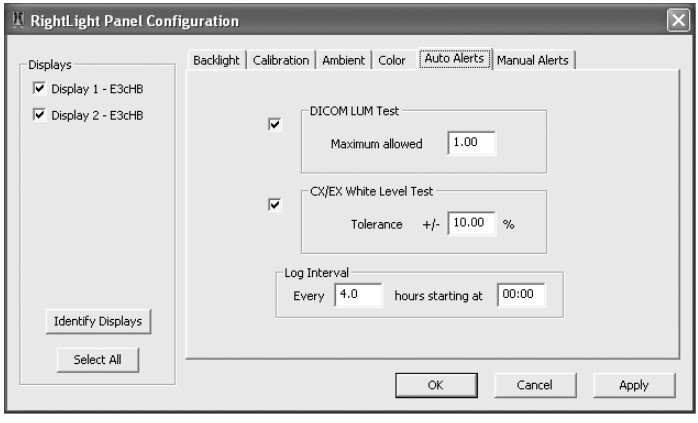
Then, set the color temperature by Kelvin scale (from 5000 to 12000) or specify the CIE xy coordinates.

Click Apply or OK.

NOTE: The LCD II photometer is required for color calibration of the Dome E2c, Dome E2cHB, Dome E3c, Dome E3cHB, and Dome E4c displays.

Auto Alerts tab

Specify the conformance test(s) you want RightLight to run. Every 5 minutes, RightLight automatically performs the tests selected on this tab. For each test you select, you can specify a threshold value that defines a test failure. RightLight alerts you of a failure in these three ways: by message, by entries in the History log, and by status change of the Dome CXtra icon in the system tray. If the Enterprise Management service is installed, an alert is also sent to the Dome Dashboard or SNMP console application.



To set auto alert parameters

1 Select either the DICOM LUM test or the CX/EX White Level test or select both.

For the DICOM LUM test, check the selection box. Then enter a value for Maximum allowed. The DICOM LUM test is classified a failure if it produces a value greater than the maximum allowed. Enter a value ranging from 0 (zero) to 2 (default=1.00). A value of 0 (zero) indicates perfect conformance with the DICOM Grayscale Standard Display Function. The DICOM LUM Test assesses the standard deviation of JNDs (Just Noticeable Differences) per digital interval.

EXAMPLE: Maximum allowed: 1.00 Result: A test result of 0.421 passes, because it is less than 1.00.

For the CX/EX White Level test, check the selection box. Then enter a value for Tolerance ±. The CX/EX White Level test is classified a failure if the measured white level is outside the range defined by this percent, applied to the Target Luminance defined on the Backlight tab. Enter a value ranging from 0 (zero) to 25 (default = 10.00). Tests producing a white level value outside of this percentage range generate a warning message.

EXAMPLE: Target white level: 600 cd/m^2
Tolerance: ±10% Result: Values outside the range from 540 to 660 (600 ± 60 cd/m^2) indicate a test failure.

2 In the Log interval section, enter a time interval and starting time for the first daily test in the hours starting at field. RightLight logs the first set of conformance tests at the time specified and at regular intervals thereafter until the end of the day.

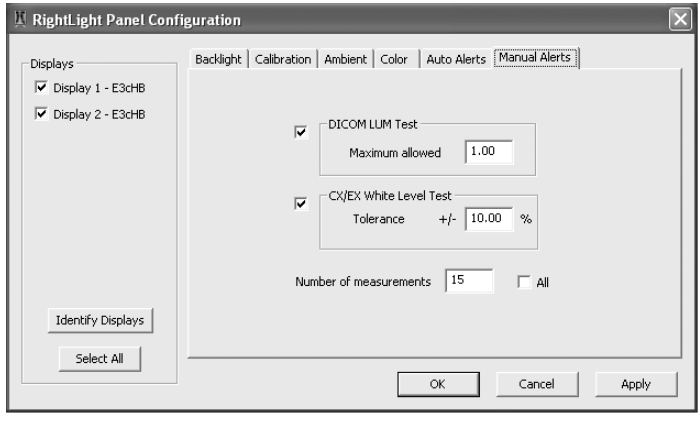
Enter a positive integer for hours and a time in the 24-hour format, such as 13:30. This interval specifies how often the system logs the results of the selected test(s).

When a selected test fails, a message appears and the Dome CXtra icon changes to indicate a warning state. View the test results in the Reporting History log.

NOTE: The log interval and start time must apply to all displays. These fields are not enabled unless all displays are selected.

Manual Alerts tab

Specify the conformance tests that you want to complete manually. For each manual test that you select, you can specify a threshold value that defines a test failure. When a failure occurs, the Dome CXtra icon is set to a warning state. In addition, if the Enterprise Management service is installed, an alert is sent to the Dome Dashboard or SNMP console application. Selections made on this tab determine operating parameters for the Conformance Wizard, which guides manual tests.



To set manual alert parameters

1 Select either the DICOM LUM test or the White Level test or both.

- For the DICOM LUM test, check the selection box. Then enter a value for Maximum allowed. The DICOM LUM test is classified a failure if it produces a value greater than the maximum allowed. Enter a value ranging from 0 (zero) to 2 (default=1.00). A value of 0 (zero) indicates perfect conformance with the DICOM Grayscale Standard Display Function.
- For the CX/EX White Level test, check the selection box. Then enter a value for Tolerance ±. The CX/EX White Level test is classified a failure if the measured white level is outside the range defined by this percent, applied to the Target Luminance defined on the Backlight tab. Enter a value ranging from 0 (zero) to 25 (default =10.00).

2 Select the number of luminance measurements you want to make during each manual test. The default number of measurements is 15.

NOTE: When you select All, 256 measurements are taken on 8-bit display systems; 1024 measurements are taken on 10-bit systems.

Checking Conformance Manually

If you have configured RightLight properly and have an external photometer installed, you can run a manual conformance test.

If you have the Privilege service installed, you must log on as a privileged user before you run a manual conformance test. (See page 96.)

As with automatic conformance testing, the manual conformance test shows how well your display conforms to the DICOM standard. You are able to specify, however, the number of measurements to be taken. See “Manual Alerts tab” on page 22 for configuration information. See “Installing the Photometer” on page 8 for how to install the photometer.

Before starting a manual conformance test, select Dome CX/EX DICOM Calibration on the services menu.

NOTE: If you run a conformance test with another response function (such as Dome CX/EX Exponential Calibration or Dome CX/EX Native Calibration), the system presents a warning message. Continuing to run the test causes the system to show the Dome CXtra icon in the warning state.

To run a manual conformance test

1 Open the Dome CXtra Services menu. Select RightLight Conformance > Manual Conformance Wizard.

2 Follow the Conformance Wizard instructions.

RightLight Manual Conformance Wizard
RightLight
conformance
Welcome to the RightLight Manual Conformance Wizard
This wizard will guide you through the steps necessary to perform conformance tests on your panels.
To continue, click Next.
< Back
Next >
Cancel

After you finish with the Conformance Wizard, RightLight enters the event in both the Reporting History log and the Conformance History log. All RightLight history events from manual conformance tests are recorded in the Reporting History log. RightLight provides additional information on conformance events in graphical and tabular formats in the Conformance History log.

If the manual conformance test produces a warning condition because the white level is beyond the tolerance set on the Manual Alerts tab (page 22), then you can correct the warning by calibrating the white level via the conformance test. Select the check box to correct the warning, and click Next. The wizard executes automatically.

RightLight Manual Conformance Wizard
Save Conformance
Follow these steps to save the conformance results.
NDS
Conformance test results are shown below.
A correctable white level calibration warning was detected.
- To correct this warning, check the checkbox to the right and click Next.
- To continue without correcting the warning, click Next.
Warning
Correct this warning
To continue, click Next.
< Back
Next >
Cancel

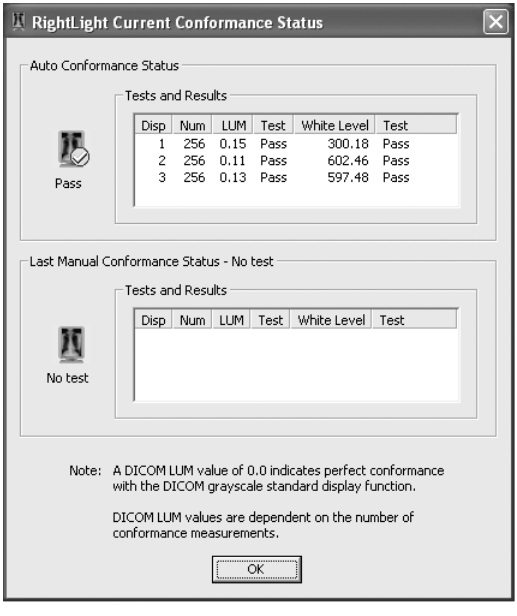
Alternatively, you can adjust the tolerance for the failing test to bring the display into conformance. (See also "White Level Calibration Service" on page 35.)

NOTE: White Level calibration during conformance testing is available only for Dome E2, Dome E3, Dome E3c, Dome E3cHB, and Dome E5 displays. You must be an administrator or a privileged user to perform a manual conformance test and to calibrate the white level during the manual conformance test.

Checking Current Conformance Status

To view the results of the latest manual conformance test, open the Dome CXtra Services menu. Select RightLight Conformance > Current Conformance Status.

In the same dialog, you can also view the results of the latest automatic conformance test.


RightLight Current Conformance Status
Auto Conformance Status
Tests and Results
Disp Num LUM Test White Level Test
1 256 0.15 Pass 300.18 Pass
2 256 0.11 Pass 602.46 Pass
3 256 0.13 Pass 597.48 Pass
Pass
Last Manual Conformance Status - No test
Tests and Results
Disp Num LUM Test White Level Test
No test
Note: A DICOM LUM value of 0.0 indicates perfect conformance with the DICOM grayscale standard display function.
DICOM LUM values are dependent on the number of conformance measurements.
OK

Reviewing Conformance Events

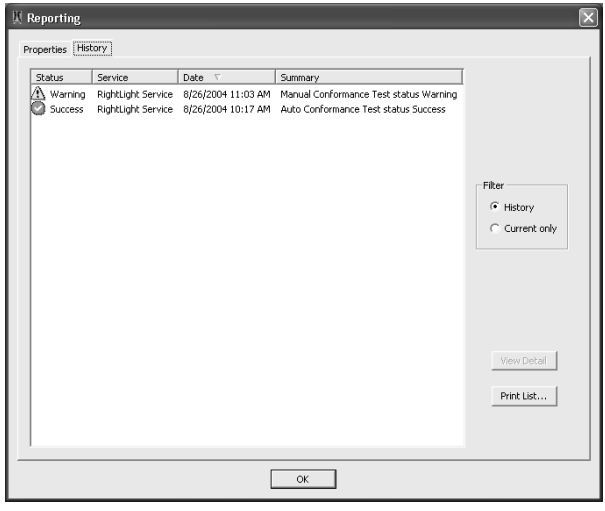
Dome CXtra polls RightLight automatically for its status every 5 minutes, which causes the user-selected tests to run. The system makes an entry in the Reporting History log by the specified logging interval on the Auto Alerts tab and whenever it detects a status change.

NOTE: When you make changes in the Auto Alerts tab, conformance tests run immediately. When you perform a manual conformance test, the system also makes an entry in the Reporting History log.

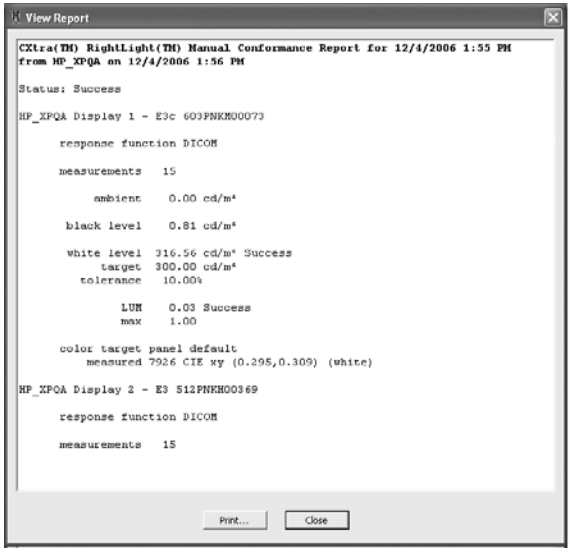
To view a conformance event

1 Open the Dome CXtra Services menu and select Reporting.

2 Click the History tab to view a list of events.



3 Select an auto or manual conformance test event and click View Detail or double-click the event to view the conformance test details.



Reviewing Manual Conformance Data

For manual conformance tests, you can specify results you want to review by display and date and then examine the data in graphical and tabular formats.

NOTE: Auto conformance data cannot be viewed this way.

To see a detailed account of a manual conformance event

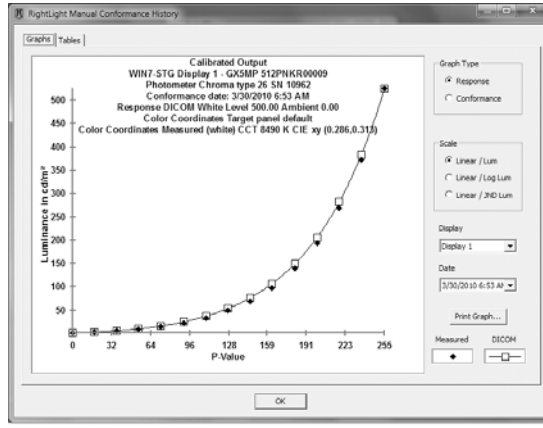
Open the Dome CXtra Services menu and select RightLight Conformance > Manual Conformance History. Then select the Graphs or Tables tab.

Graphs tab

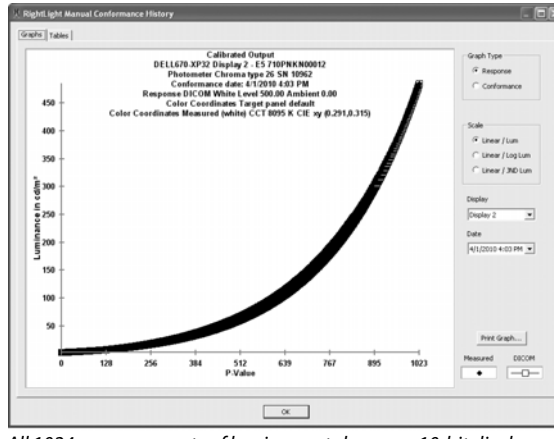
To view or print a conformance test, choose a graph type, display, and selected test date and time to view or print the graphical data. When using multiple displays, choose the individual display for which you want test results from the Display pull-down list. Select a particular conformance test by date and time from the Date pull-down list.

Graph type

- Response graph. Plots the measured luminance at various driving levels (P-values). Luminance is shown along the Y axis using a scale that you select from three options: Linear / Lum, Linear / Log Lum, and Linear / JND Lum. The graph consists of the luminance values specified by the DICOM standard and the luminance values measured during the conformance test. The better the data points align with the curve, the better the DICOM conformance.

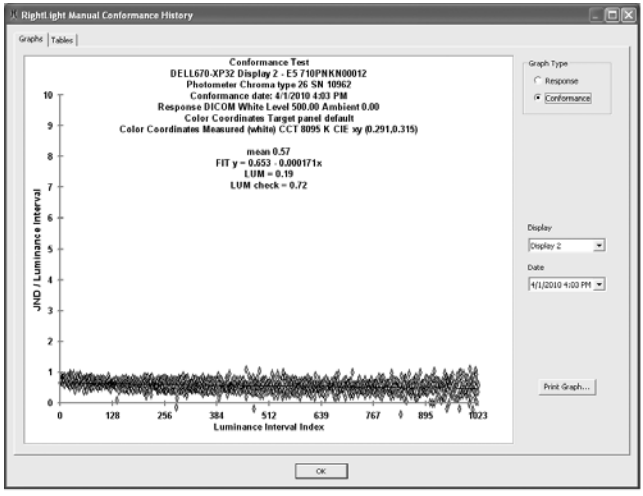


Default 15 measurements of luminance taken on an 8-bit display



All 1024 measurements of luminance taken on a 10-bit display

- Conformance graph. Plots Just Noticeable Differences (JNDs) per luminance interval. The graph shows the mean value for JND/luminance interval, the DICOM Luminance Uniformity Metric (LUM), and the line of best fit (FIT). These values are useful in quantifying the quality of conformance with the DICOM Grayscale Standard Display Function. The closer the JND values are to the mean line, the better the DICOM conformance. Moreover, the closer the calculated LUM metric is to 0 (zero), the better the DICOM conformance.

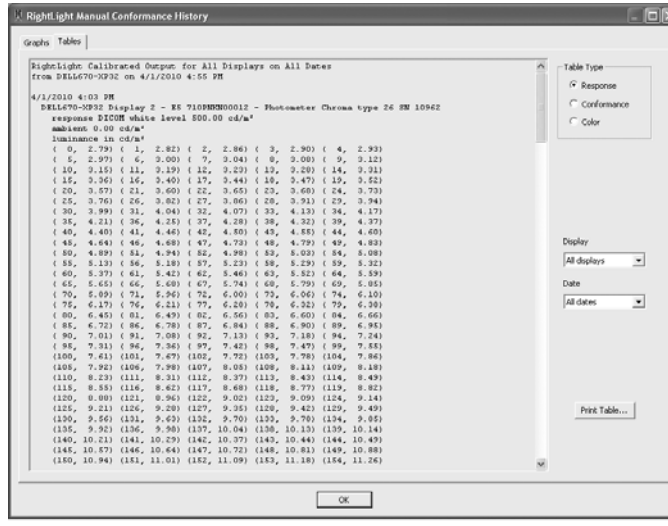


Tables tab

To view or print a conformance test, choose a table type, display, and selected test date and time to view or print the tabular data. When using multiple displays, choose the individual display for which you want test results from the Display pull-down list. Select a particular conformance test by date and time from the Date pull-down list.

Table type

- Response table. Lists the luminance value measured for each luminance interval in a selected conformance test.



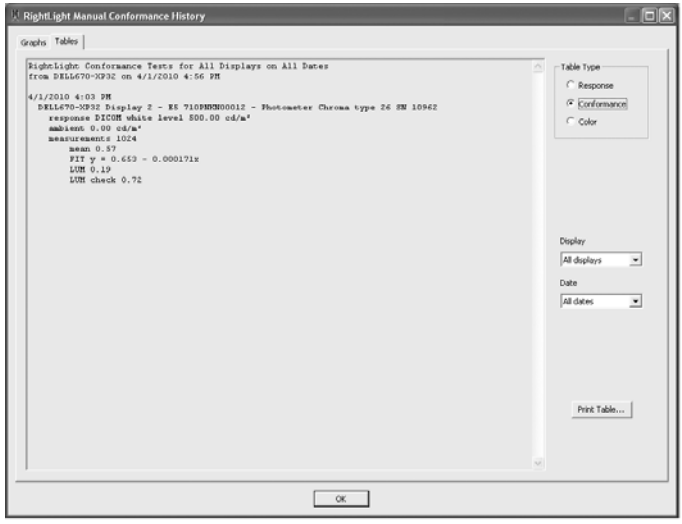
- Conformance table. Lists the following data values for a test.

– Number of measurements

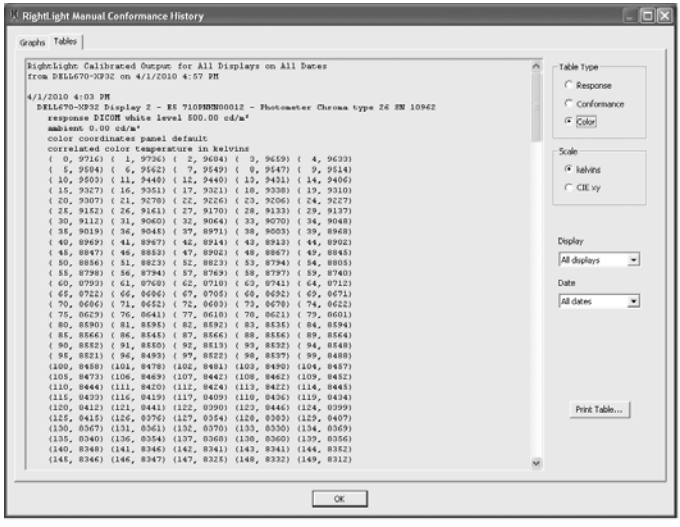
– Mean value of JND/Luminance Interval

– Best fit (FIT) line expression

– LUM



- Color table. Lists the following data values by Kelvin scale or CIE xy coordinates.



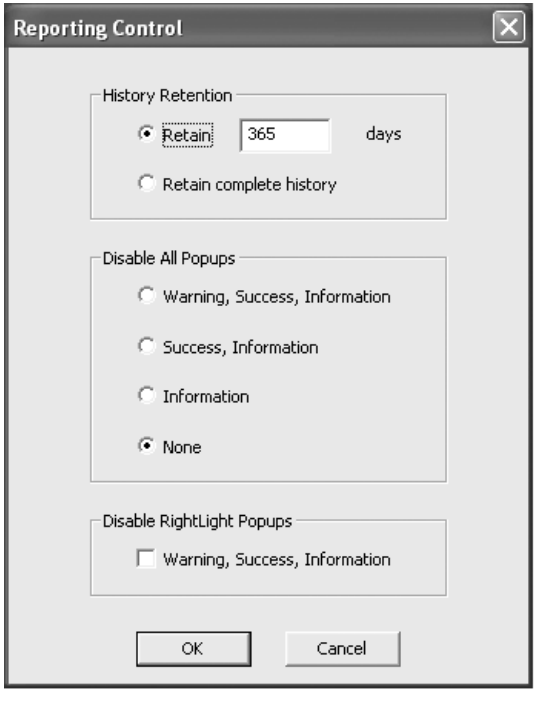
Disabling RightLight Popup Warnings

You can disable all warning message popups related to the RightLight service.

NOTE: Disabling of warning message popups is not recommended. Read the notice on page 34 before disabling any popups.

To disable RightLight popup warnings

1 Open the Dome CXtra Services menu and select Reporting Control.



2 Check the box in the Disable RightLight Popups field.

3 Click OK.

NOTE: The Dome CXtra icon on the Windows taskbar continues to show warning conditions from the RightLight service and RightLight warnings continue to be recorded in the Dome CXtra history log.

Important notice on disabling RightLight popup messages

WARNING: The Dome CXtra software includes "popup" warning dialogs (popups), which, unless disabled, appear on the operator's display screen under various operational conditions. These warnings include important messages about the performance of the display which may impact the integrity and reliability of the information displayed, such that the accuracy of the radiologist's or other medical user's diagnosis may be compromised. For example, a popup may warn the operator that the display is out of DICOM conformance to ensure an accurate display image. The Dome CXtra software includes a feature that allows the PACS or system administrator to disable the popup feature such that no popups appear on the operator's display screen, even if such popup warning is warranted under the particular operational circumstances.

While Dome provides this feature as a convenience for those who choose not to view popup warnings and, accordingly, agree to assume the risk of any and all consequences of not viewing such messages, DOME DOES NOT RECOMMEND THE DISABLING OF THIS IMPORTANT POPUP SAFETY FEATURE.

LIMITATION OF LIABILITY: BY DISABLING THE POPUP FEATURE, THE CUSTOMER, OWNER AND ANY USER ACKNOWLEDGE THAT SUCH CUSTOMER, OWNER OR USER UNDERSTANDS AND ASSUMES ALL RISKS AND ACCEPTS FULL RESPONSIBILITY FOR ANY HARMS, INJURIES, DAMAGES AND FEES WHICH ARISE OUT OF OR RELATE TO THE ABSENCE OF SUCH POPUP WARNINGS. THESE INCLUDE ALL CONSEQUENTIAL, INCIDENTAL, INDIRECT, SPECIAL, AND PUNITIVE DAMAGES, AS WELL AS ALL ASSOCIATED ATTORNEY FEES, EXPENSES AND COSTS, ARISING OUT OF OR RELATING TO THE NON-USE OF THE POPUP SAFETY FEATURE. FURTHER, SUCH CUSTOMER, OWNER OR USER SHALL INDEMNIFY AND DEFEND DOME AND HOLD DOME HARMLESS FROM ANY AND ALL SUCH HARMS, INJURIES, DAMAGES, AND FEES WHETHER SUCH HARMS, INJURIES, DAMAGES, AND FEES ARISE FROM OR RELATE TO ACTIONS IN TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY), CONTRACT, STATUTE, OR OTHERWISE, AND DOME'S LIABILITY SHALL BE LIMITED TO THE PRICE PAID FOR THE SUBJECT PRODUCT.

White Level Calibration Service

The white level of a Dome display is stabilized by the internal RightLight photometer that is calibrated during display manufacture. The White Level Calibration service allows the end user to calibrate the sensor using an external photometer. When the calibration is completed, the new calibration data file is stored in the display.

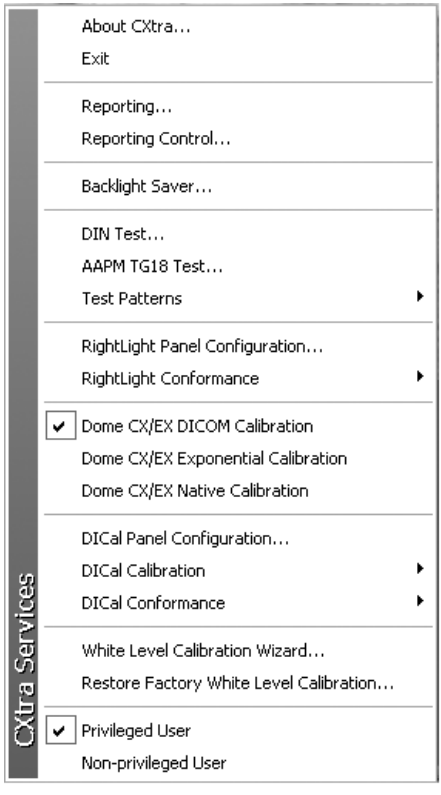
A one-time, end-user calibration of the white level may be necessary when the target luminance is outside the tolerance established for proper display conformance, such as when the white level of a display has failed a manual conformance test, or when two or more displays in a multi-unit configuration show disparate white levels. The calibration may also be required for equipment changes, such as when new external photometers are installed at your facility.

IMPORTANT: Only administrators can calibrate the white level via the White Level Calibration service and restore factory calibration.

White level calibration via the White Level Calibration service is available for use on all Dome CX and Dome EX displays. Restoration of the factory white level calibration is available only for Dome E2, Dome E3, Dome E3c, Dome E3cHB, and Dome E5 displays.

Privileged users can calibrate the white level during manual conformance testing. For more information, see "To run a manual conformance test" on page 24.

When you log on as administrator, the CXtra Service menu expands to include two functions, White Level Calibration Wizard and Restore Factory White Level Calibration. (See "Logging On as Privileged User/ Administrator" on page 96.)



Two additional functions appear on the CXtra Services menu– White Level Calibration Wizard and Restore Factory White Level Calibration–when an administrator is logged on to calibrate the display white level

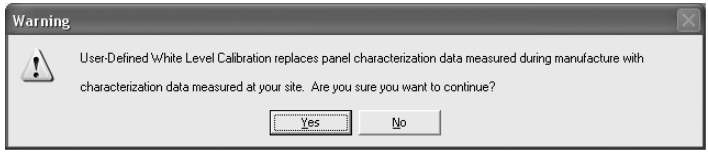
Running the White Level Calibration Wizard

IMPORTANT: White level calibration via the White Level Calibration service is available for use on all Dome CX and Dome EX displays. Restoration of the factory white level calibration is available only for Dome E2, Dome E3, Dome E3c, Dome E3cHB, and Dome E5 displays.

To calibrate the white level

First, open the CXtra Services menu and click White Level Calibration Wizard.

Next, click Yes to proceed in replacing the factory calibration data with the calibration data to be measured at your site.


Warning
User-Defined White Level Calibration replaces panel characterization data measured during manufacture with characterization data measured at your site. Are you sure you want to continue?
Yes
No

Then, follow the calibration wizard to reinitialize the display panel.

User-Defined White Level Calibration Wizard
USER-DEFINED
White Level calibration
Welcome to the User-Defined White Level Calibration Wizard
This wizard will guide you through the steps necessary to calibrate the white level on multiple panels.
To continue, click Next.
< Back
Next >
Cancel

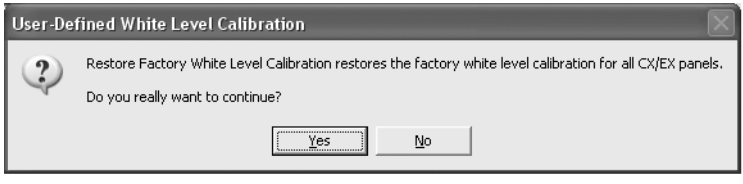
Restoring Factory White Level Calibration

IMPORTANT: Restoration of the factory white level calibration is available only if you have previously calibrated the white level using the White Level Calibration service or via RightLight manual conformance testing. Factory calibration can be restored only for Dome E2, Dome E2cHB, Dome E3, Dome E3c, Dome E3cHB, and Dome E5 displays.

To restore factory calibration

Open the CXtra Services menu and select Restore Factory White Level Calibration. Click Yes to restore factory calibration.

After the factory calibration is restored, the Restore Factory White Level Calibration function is greyed out on the CXtra Services menu.


User-Defined White Level Calibration
Restore Factory White Level Calibration restores the factory white level calibration for all CX/EX panels.
Do you really want to continue?
Yes
No

NOTE: You must be logged on as administrator to restore factory calibration.

DICal Service

You can use the DICal service to adjusts the characteristic curve of the Dome Q2, GX2MP, and select desktop displays (such as models PX1910M and PX212M) to conform to the DICOM Grayscale Standard Display Function.

The configuration of the service provides an option for default DICOM calibration (for viewing diagnostic images), which is adequate for many applications. For additional calibration accuracy or to verify calibration, you can purchase the optional LCD or LCD II photometer and use the DICal service to perform custom calibration based on the actual luminance values of your display.

In addition to the DICOM response function, you can choose to use the exponential, gamma, or original response function. When you add all functions to the Dome CXtra Services menu, you can switch quickly from one response function to another. Moving from one response function to another causes an immediate change to the display calibration.

The DICal service also allows you to test your calibrated display to verify that it conforms to the DICOM standard.

NOTE: See “Enabling DICOM Calibration on Third-Party Monitors” on page 53 if you are using a third-party monitor.

To facilitate the configuration of multiple displays, you can export the characterization data from one system to another.

NOTE: During the characterization or calibration process, you can skip or ignore non-DICal displays on the system.

Configuring the DICal Service

The desktop display ships with brightness and contrast values already set as shown in the table below for DICOM compliance. Start at procedure step 2 to configure the DICal service upon initial use. Use the entire procedure to configure the service after display settings have been changed.

To configure the DICal service

1 Set the brightness and contrast of your display to the values in this table. (Refer to the display manual for how to set the values.)

Display Model	Brightness	Contrast
Dome Q2	65%	N/A
GX2MP (JUN 2007 or later)	75%	70%
GX2MP	75%	70%
Desktop PX191	70%	50%
Desktop PX1910M (2007 or later)	70%	60%
Desktop PX1910M	70%	50%
Desktop PX212M	80%	80%
Desktop PX212M (RoHS)	80%	50%

2 Open the Dome CXtra Services menu and select DICal Panel Configuration.

3 Verify that the model number of your display appears in the dialog.

If the correct model number is visible, skip to step 5.

If the model number is incorrect, continue to step 4.

4 Click Edit Type, select the model number of the display from the drop-down list, and click OK.

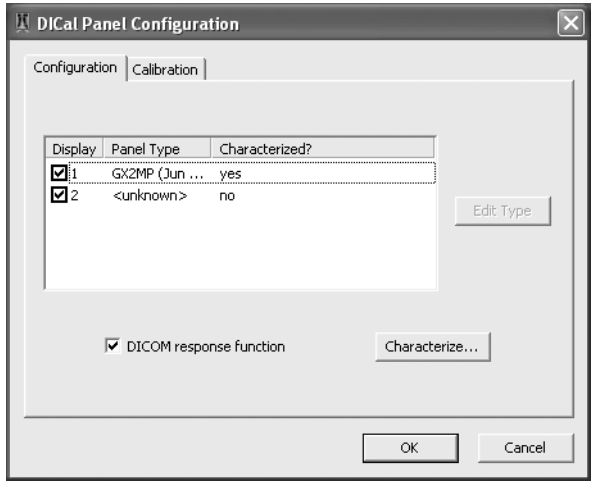
NOTE: Displays listed have been characterized; therefore, the Characterize button is disabled. You cannot recharacterize a display that has been characterized previously.

5 Open the Calibration tab and select DICOM response function.

6 Click OK.

Using DICOM Response Function as Default Calibration

Open the DICal Panel Configuration dialog to the Configuration tab. To activate DICOM grayscale calibration at each system startup, click the check box for DICOM response function.



The default DICOM calibration is applied to your display settings whenever you select Desktop DICOM Calibration from the services menu. No other steps are needed to apply the DICOM calibration after installation.

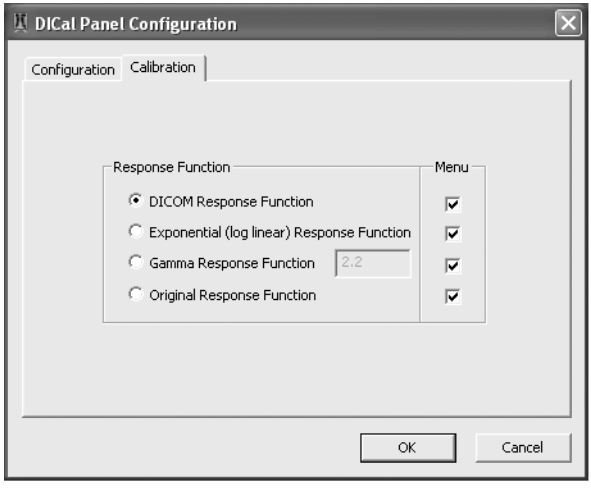
To apply the original calibration each time you start the system, leave the box unchecked.

To apply another response function, choose from the options on the Calibration tab. See “Choosing Display Calibration” on page 42.

NOTE: For proper display calibration, you must configure the DICal service after installation. See page 40.

Choosing Display Calibration

Besides DICOM calibration, you can choose to use exponential, gamma, or original display calibration. Open the CXtra Services menu, then select DICal Panel Configuration and Calibration tab.



Choose one of these response functions for auto-calibration:

- DICOM Response Function – Calibrates to the DICOM Grayscale Standard Display Function. See DICOM PS 3.14-2000 (Digital Imaging and Communications in Medicine (DICOM), Part 14: Grayscale Standard Display Function).
- Exponential Response Function – Calibrates to an exponential (log linear) response function. The logarithm of the luminance is a linear function of the digital driving level.
- Gamma Response Function – Calibrates to a gamma (nonlinear) response function. The default value is 2.2. The range extends from 1.5 to 3.5; the CRT gamma standard ranges from 2.0 to 2.5.
- Original Response Function – Calibrates the desktop its original response function. The characteristic curve is the response function of the display with no calibration applied. This is the response function created by loading a linear gamma correction table, or GCT. (This function is appropriate for running typical Windows applications.)

NOTE: Upon software installation, only Desktop DICOM Calibration and Desktop Original Calibration are default entries on the services menu. On the Calibration tab, select or deselect check boxes in the Menu field to customize calibration entries on the services menu.

To switch to another calibration

Open the Dome CXtra Services menu. Choose from the display calibrations you have added to the services menu. Otherwise, go to the Calibration tab of the DICal Panel Configuration dialog to make a choice. Click OK to finish. Your selection causes an immediate change to the display calibration.

NOTE: If a photo-editing program or other Windows application performs a color calibration while DICOM Calibration is selected, the DICal menu selection switches to Original Calibration and a warning appears. To reapply the DICOM calibration, select the command from the services menu or the DICal Panel Configuration dialog.

Performing a Custom DICOM Calibration

A custom DICOM calibration uses the actual luminance values of your display to adjust the response curve. After you complete the calibration, the new values are applied in place of the default DICOM calibration whenever DICOM Calibration is selected on the services menu.

NOTE: This procedure requires installation of the optional LCD or LCD II photometer as described on page 8.

To perform a custom calibration

1 If you have one of the display models listed below, follow instructions provided with the display to verify that the contrast is set to the value shown.

Display Model	Contrast
GX2MP	70%
GX2MP (JUN 2007 or later)	70%
PX191	50%
PX1910M (2007 or later)	60%
PX1910M	50%
PX212M	80%
PX212M (RoHS)	50%

2 If the Privilege service has been installed, log on as a privileged user. (See page 96.)

3 Open the Dome CXtra Services menu. Select DICal Calibration > Calibration Wizard.

4 Follow the instructions for using the photometer in each Calibration Wizard window and click Next.
NOTE: Abort the calibration at any time by pressing Ctrl+C.

5 If necessary, verify that your display calibration conforms to the DICOM standard. (See page 46 for instructions.)
NOTE: If you change panel brightness using the brightness control on the display, you must repeat the preceding calibration steps.

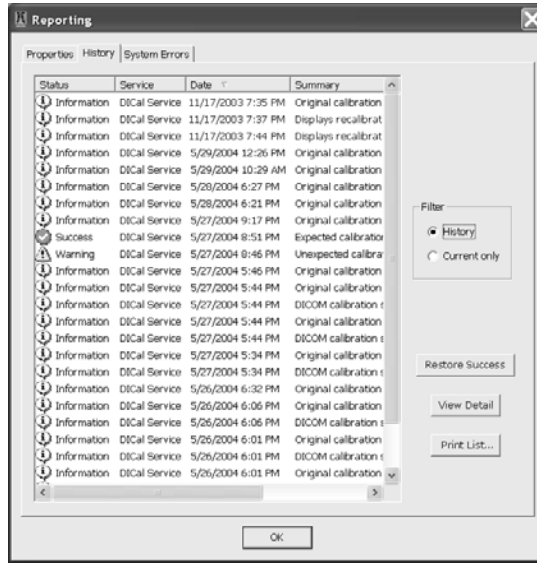
Reviewing Calibration Events

The Dome CXtra software records an event in the History event log each time you perform a calibration.

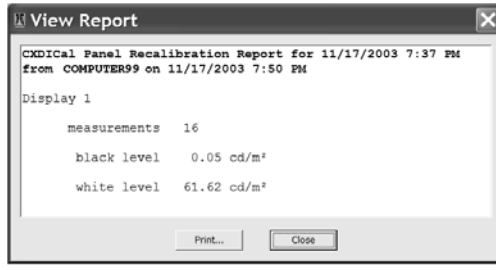
To review a calibration event

1 Open the Dome CXtra Services menu and select Reporting.

2 Click the History tab to see a list of events.


Reporting
Properties
History
System Errors
Status
Service
Date
Summary
Information DICal Service 11/17/2003 7:35 PM Original calibration
Information DICal Service 11/17/2003 7:37 PM Displays recalibrat
Information DICal Service 11/17/2003 7:44 PM Displays recalibrat
Information DICal Service 5/29/2004 12:26 PM Original calibration
Information DICal Service 5/29/2004 10:29 AM Original calibration
Information DICal Service 5/28/2004 6:27 PM Original calibration
Information DICal Service 5/28/2004 6:21 PM Original calibration
Information DICal Service 5/27/2004 9:17 PM Original calibration
Success DICal Service 5/27/2004 8:51 PM Expected calibratio
Warning DICal Service 5/27/2004 8:46 PM Unexpected calibra
Information DICal Service 5/27/2004 5:46 PM Original calibration
Information DICal Service 5/27/2004 5:44 PM Original calibration
Information DICal Service 5/27/2004 5:44 PM DICOM calibration
Information DICal Service 5/27/2004 5:44 PM Original calibration
Information DICal Service 5/27/2004 5:44 PM DICOM calibration
Information DICal Service 5/27/2004 5:34 PM Original calibration
Information DICal Service 5/27/2004 5:34 PM DICOM calibration
Information DICal Service 5/26/2004 6:32 PM Original calibration
Information DICal Service 5/26/2004 6:06 PM Original calibration
Information DICal Service 5/26/2004 6:06 PM DICOM calibration
Information DICal Service 5/26/2004 6:01 PM Original calibration
Information DICal Service 5/26/2004 6:01 PM DICOM calibration
Information DICal Service 5/26/2004 6:01 PM Original calibration
Filter
History
Current only
Restore Success
View Detail
Print List...
OK

3 Click a DICal service calibration event, then click View Detail to see detailed information about the event.



NOTE: Only calibration and test status events have detailed information available.

Performing a Conformance Test

You can use DICal service to verify that your display conforms to the DICOM standard.

NOTE: This procedure requires installation of the optional LCD or LCD II photometer. (See page 8.)

To perform a conformance test

1 If the Privilege service has been installed, log on as a privileged user. (See page 96.)

2 Open the Dome CXtra Services menu and select DICal Conformance > Conformance Wizard.

3 Follow the instructions for using the photometer in each Conformance Wizard window and click Next.

NOTE: Press Ctrl+C to abort the test at any time.

4 If the last DICal Conformance Wizard window indicates that the display conforms to DICOM standards, click Next or Finish. Go to step 5.

If the last DICal Conformance Wizard window contains a warning, click Next or Finish to close the window. Perform a custom DICOM calibration as described on page 44. After calibration, perform another conformance test. Start at step 1.

5 If necessary, review the conformance test data and test events according to instructions in the following section.

Reviewing Conformance Test Data

Whenever you perform a conformance test, the DICal service stores the generated data in both graphical and tabular formats.

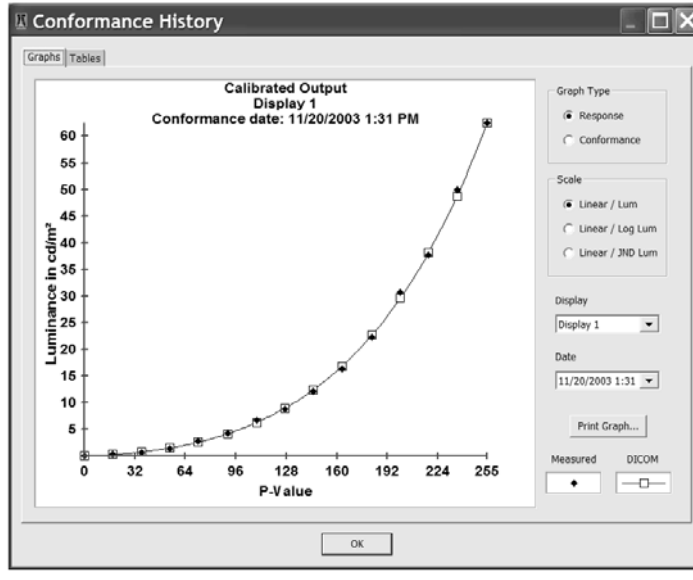
To view the most recent conformance data, open the Dome CXtra Services menu and select DICal Conformance > Conformance History. The Conformance History dialog opens with Graphs and Table tabs. The Graphs tab appears initially by default.

Using the Graphs Tab

Use the controls on the Graphs tab to select a conformance test and change how the system shows the data for a selected test. When using multiple display panels, select a particular panel in the Display drop-down list. Select a particular conformance test by selecting the data and time of the test in this drop-down list. Use Print Graph to output the graph currently on the screen.

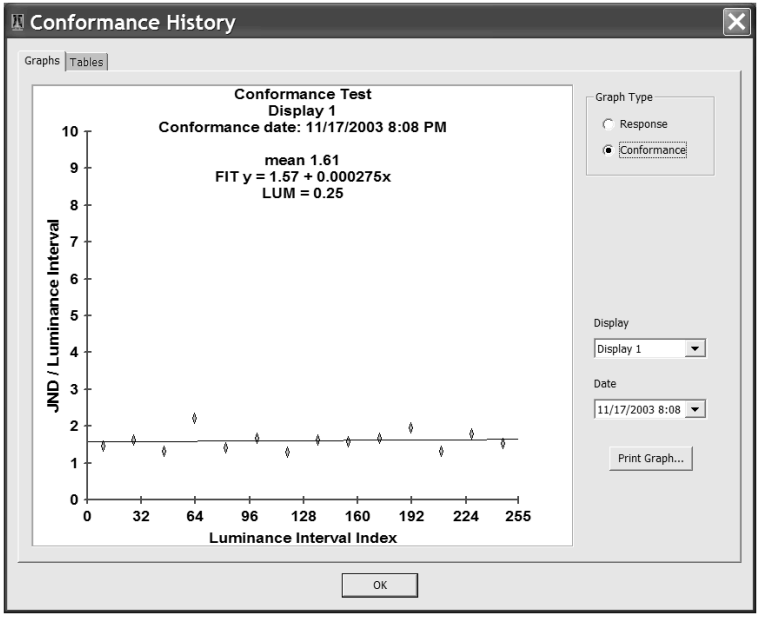
Graph Type

- Response. Presents the luminance values at various luminance intervals (P-values). Luminance is shown along the vertical axis using a scale that you select from three options: Linear / Lum, Linear / Log Lum, and Linear / JND Lum. The Response graph consists of a curve and a set of data points. The curve shows the luminance values specified by the DICOM standard and the data points show the luminance values measured during the conformance test. In general, the closer the data points match the curve, the better the DICOM conformance.



- Conformance. Presents values of Just Noticeable Differences (JND) per luminance interval and the mean value for JND/luminance interval. These values include the Luminance Uniformity Metric (LUM - DICOM metric) value and the FIT line expression used to quantify the degree of conformance.

  In general, the closer the JND values are to the mean line, the better the DICOM conformance. In addition, the closer the calculated LUM metric is to 0 (zero), the better the DICOM conformance.



Using the Tables Tab

The Tables tab shows response and conformance numerical data for a given conformance test. When using multiple display panels, select a particular panel in the Display drop-down list. Select a particular conformance test by selecting the data and time for the test in this drop-down list. Use Print Table to output the data currently on the screen.

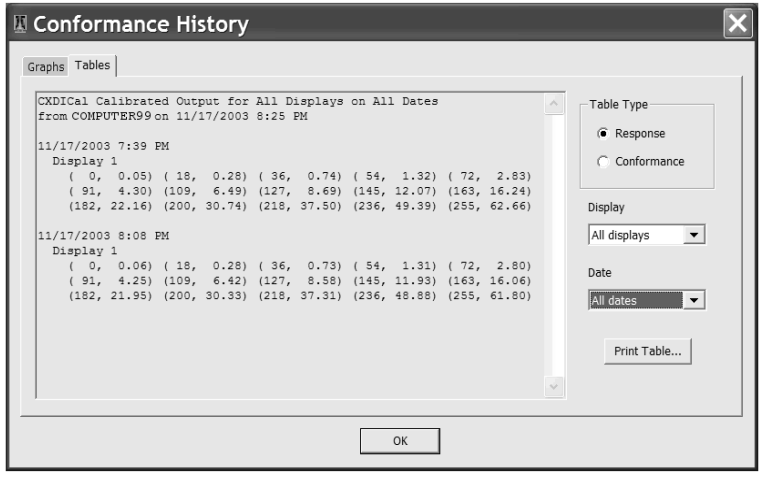


Table Type

- Response. Presents the luminance value measured for each luminance interval in a selected conformance test.
- Conformance. Shows the following data values for a selected test:
  - Number of measurements
  - Mean value of JND/Luminance Interval
  - Best fit (FIT) line expression
  - LUM

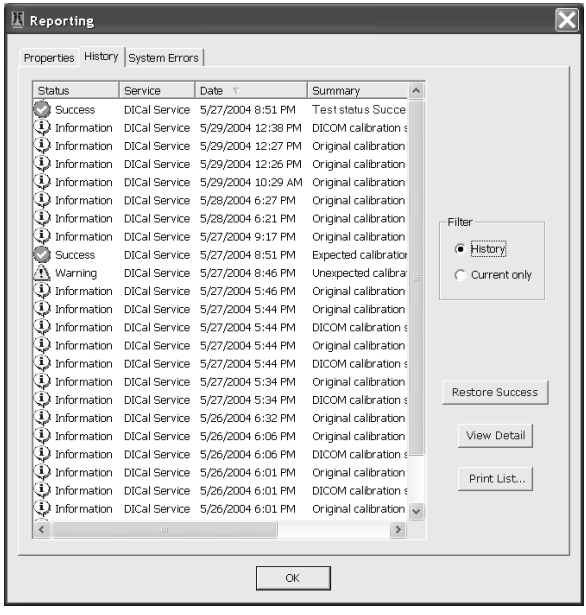
Reviewing Conformance Test Events

The Dome CXtra system records an event in the History event log each time you complete a conformance test.

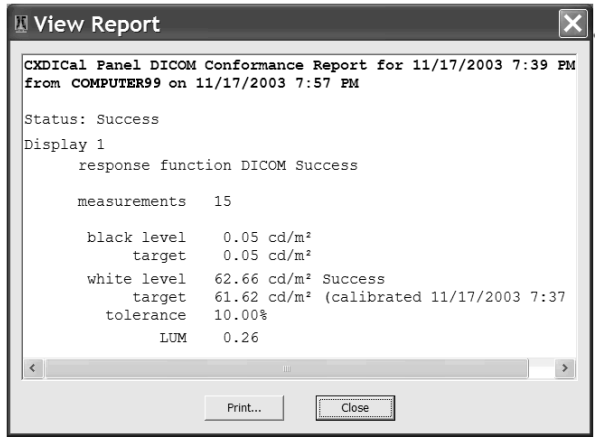
To review a conformance test event

1 Open the Dome CXtra Services menu and select Reporting.

2 Click the History tab to see a list of events.


Reporting
Properties
History
System Errors
Status
Service
Date
Summary
Success DICal Service 5/27/2004 8:51 PM Test status Succe
Information DICal Service 5/29/2004 12:38 PM DICOM calibration
Information DICal Service 5/29/2004 12:27 PM Original calibration
Information DICal Service 5/29/2004 12:26 PM Original calibration
Information DICal Service 5/29/2004 10:29 AM Original calibration
Information DICal Service 5/28/2004 6:27 PM Original calibration
Information DICal Service 5/28/2004 6:21 PM Original calibration
Information DICal Service 5/27/2004 9:17 PM Original calibration
Success DICal Service 5/27/2004 8:51 PM Expected calibration
Warning DICal Service 5/27/2004 8:46 PM Unexpected calibra
Information DICal Service 5/27/2004 5:46 PM Original calibration
Information DICal Service 5/27/2004 5:44 PM Original calibration
Information DICal Service 5/27/2004 5:44 PM DICOM calibration
Information DICal Service 5/27/2004 5:44 PM Original calibration
Information DICal Service 5/27/2004 5:44 PM DICOM calibration
Information DICal Service 5/27/2004 5:34 PM Original calibration
Information DICal Service 5/27/2004 5:34 PM DICOM calibration
Information DICal Service 5/26/2004 6:32 PM Original calibration
Information DICal Service 5/26/2004 6:06 PM Original calibration
Information DICal Service 5/26/2004 6:06 PM DICOM calibration
Information DICal Service 5/26/2004 6:01 PM Original calibration
Information DICal Service 5/26/2004 6:01 PM DICOM calibration
Information DICal Service 5/26/2004 6:01 PM Original calibration
Filter
History
Current only
Restore Success
View Detail
Print List...
OK

3 Click a conformance test status event, then click View Detail to see a summary of information about that test.



NOTE: Only test events and calibration events have detailed information available.

Advanced Options

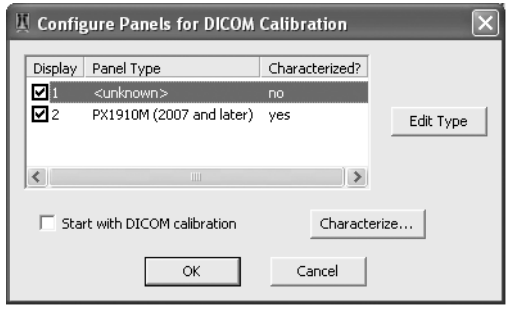
When you connect a third-party monitor or unsupported display to your system, you see that the Dome CXtra software labels it “unknown” and “not” characterized in the DICal Panel Configuration dialog. The DICal service needs to characterize or recognize a display before it performs calibration.

When the third-party monitor or unsupported display lacks a characterization data file, run the characterization wizard, then save the panel type with a unique name. After you generate the data file, you can export it to other systems to characterize identical displays.

Characterizing a Display

Run the Characterization wizard from one of two locations:

- Open the Dome CXtra Services menu and select DICal Calibration > Characterization Wizard.
- Open the Dome CXtra Services menu and select DICal Panel Configuration. Highlight the display and click Characterize.

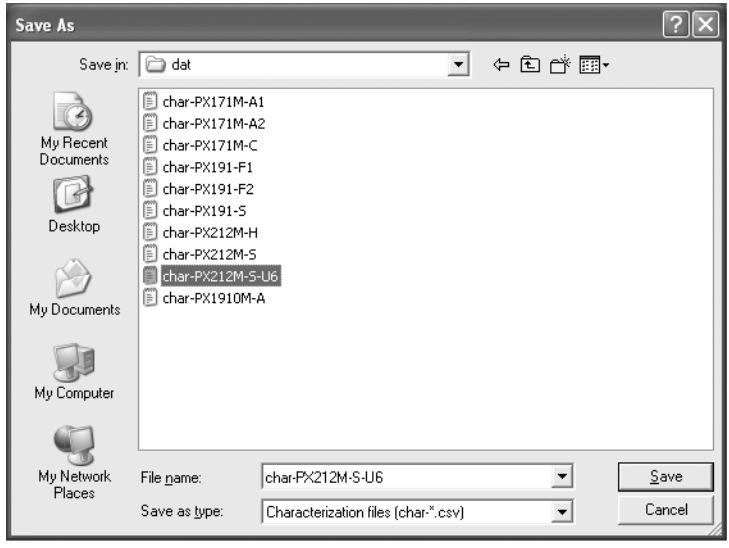


NOTE: The number of measurements you can take ranges from 0 to 256. At a minimum, run the default of 64 measurements.

Exporting Characterization Data

Open the Dome CXtra Services menu. Select DICal Calibration > Export characterization data.

Select the data file to export, then store it in the Dome CXtra dat folder on the other system.



Enabling DICOM Calibration on Third-Party Monitors

After characterization, operate the third-party monitor with Desktop DICOM Calibration enabled.

You can undo the Panel Type selection for third-party monitors using Edit Type. Choose <Not characterized> and click OK.

Test Patterns Service

You can view a variety of test patterns for assessing image quality using the Test Patterns service. Two categories of test patterns are installed with the service:

- AAPM (American Association of Physicists in Medicine) TG18
- Miscellaneous patterns such as SMPTE, horizontal and vertical ramps, and geometric distortions

You can also import custom test patterns in .DCM, .DC3, .JPG, or .TIF formats, as well as perform visual and interactive evaluations.

NOTE: You can manage custom test patterns only if the program feature for doing so has been installed.

AAPM TG18 Test Patterns

AAPM TG18 patterns provided with the Test Patterns service are described in American Association of Physicists in Medicine (AAPM), Task Group 18 Assessment of Display Performance for Medical Imaging Systems Pre-print Draft (v9.0), October 9, 2002.

Different pattern sets allow you to assess six different display characteristics. The table on page 55 shows the six sets of AAPM TG18 patterns provided with Test Patterns service. Most patterns are available in a1024 x 1024 size and some are available in a 2048 x 2048 size.

Miscellaneous Test Patterns

The following miscellaneous test patterns are installed with Test Patterns service.

- Bull's-eye
- Geometrical Distortions Coarse
- Geometrical Distortions Fine
- Geometrical Distortions Hs
- Horizontal Ramp
- Single pixel
- SMPTE
- Vertical Ramp

AAPM TG18 Test Patterns

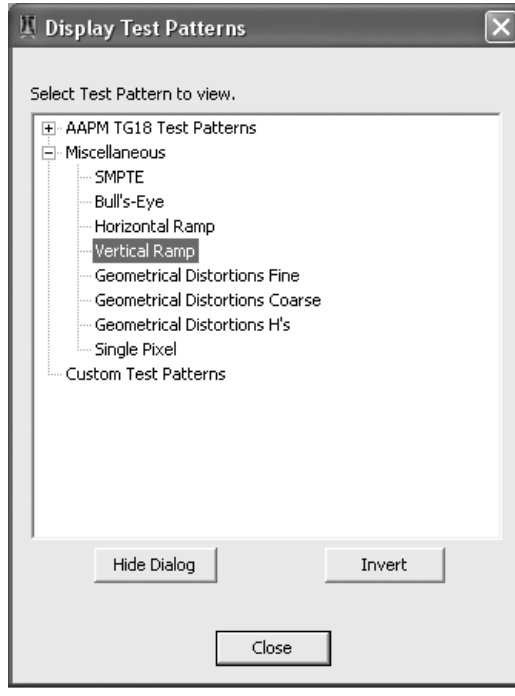
Set	Series	Type	Images	Description
Multi Purpose (1K and 2K)	TG18-QC	Vis./Qnt	1	Resolution, luminance, distortion, artifacts
	TG18-BR	Visual	1	Briggs pattern, low contrast detail vs. luminance
Luminance (1K only)	TG18-CT	Visual	1	Luminance response
	TG18-LN	Quant.	18	DICOM grayscale calibration series
	TG18-UN	Visual	2	Luminance and color uniformity and angular response
	TG18-UNL	Quant.	2	Same as above with defining lines
	TG18-AD	Visual	1	Contrast threshold at low luminance for evaluating display reflection
Resolution	TG18-RH	Quant.	3	5 horizontal lines at 3 luminance levels for LSF evaluation
	TG18-RV	Quant.	3	5 vertical lines at 3 luminance levels for LSF evaluation
	TG18-PX	Quant.	1	Array of single pixels for spot size
	TG18-CX	Visual	1	Array of Cx patterns and a scoring reference for resolution uniformity

Set	Series	Type	Images	Description
Resolution, cont.	TG18-LPH	Visual	3	Horizontal bars at 1 pixel width, 1/16 modulation, 3 luminance levels
	TG18-LPV	Visual	3	Vertical bars at 1 pixel width, 1/16 modulation, 3 luminance levels
Noise (1K only)	TG18-AFC	Visual	1	4 AFC contrast-detail pattern, 4 CD values
	TG18-NS	Quant.	3	Similar to RV/RH, 5 uniform regions for noise evaluation
Glare (1K only)	TG18-GV	Visual	2	Dark spot pattern with low contrast object
	TG18-GQ	Quant.	3	Dark spot pattern for glare ratio measurement
	TG18-GA	Quant.	8	Variable size dark spot patterns
Anatomical	TG18-CH	Visual	1	Reference anatomical PA chest pattern
	TG18-KN	Visual	1	Reference anatomical knee pattern
	TG18-MM	Visual	2	Reference anatomical mammogram pattern

Displaying Test Patterns

To select and display a test pattern

1 Open the Dome CXtra Services menu and select Test Patterns > View Test Patterns. The Display Test Patterns dialog opens.



2 Click the plus sign (+) beside a test pattern set to see variations of the test pattern.

NOTE:

- Some AAPM TG18 patterns have variations such as 10%, 50%, and 80%.
- On display systems configured for 10-bit imaging, you can view the horizontal and vertical ramps to see the differences in 8- and 10-bits per pixel. On the horizontal ramp, the top half is 10-bit; the bottom half, 8-bit. On the vertical ramp, the left half is 10-bit; the right half, 8-bit.

3 Click a pattern or variation name to show that pattern.

To invert the pattern (change black to white and white to black), click the Invert. (Some test patterns cannot be inverted.)

4 If necessary, click Hide Dialog to provide a clear view of the pattern.

To restore the dialog, press the space bar.

5 To exit the test pattern and the dialog, click Close.

Adding a Custom Test Pattern

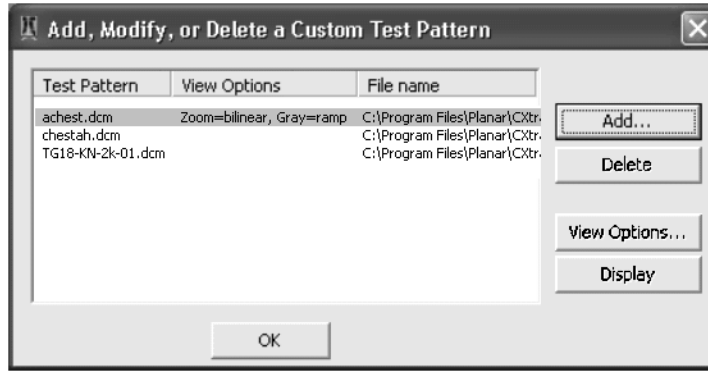
You can add test patterns of the following types to the Display Test Patterns dialog described in the preceding section:

- DCM or DC3 (DICOM)
- JPG
- TIF or TIFF

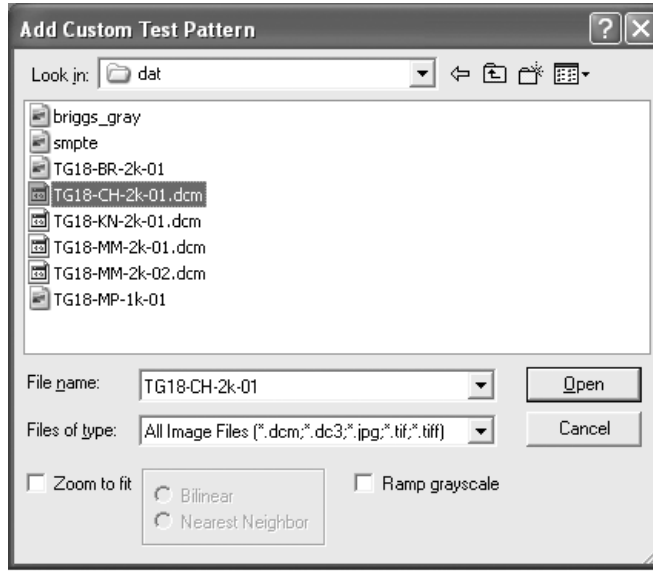
To add a custom test pattern

1 If the Privilege service has been installed, log on as a privileged user. (See page 96.)

2 Open the Dome CXtra Services menu and select Test Patterns > Manage Custom Test Patterns. The Add, Modify, or Delete a Custom Test Pattern dialog opens.



3 Click Add to open the Add Custom Test Pattern dialog.



4 Using the Look In drop-down list, navigate to the folder containing the pattern you want to add.

5 Select a .dcm, .dc3, .jpg, .tif, or .tiff pattern file.

6 If appropriate, select a view option:

– Zoom to fit (Select a sizing method of Bilinear or Nearest – Neighbor if you choose this option.)

– Ramp grayscale

7 Click Open.

The selected pattern appears in the Add, Modify, and Delete a Custom Test Pattern dialog.

8 To add another custom pattern, return to step 4.

If you are finished adding patterns, click OK.

Modifying or Deleting Custom Test Patterns

To modify or delete a custom pattern

1 If the Privilege service has been installed, log on as a privileged user. (See page 96.)

2 Open the Dome CXtra Services menu and select Test Patterns > Manage Custom Test Patterns. The Add, Modify, or Delete a Custom Test Pattern dialog opens.

3 Select the test pattern to be modified or deleted.

4 Click one of the following buttons as needed:

   – Delete. Removes the custom test pattern.

   – View Options. Opens a dialog for changing the Ramp Grayscale and Zoom to fit parameters.

   – Display. Shows the selected pattern. Click the Dome CXtra icon on the taskbar to open the dialog again.

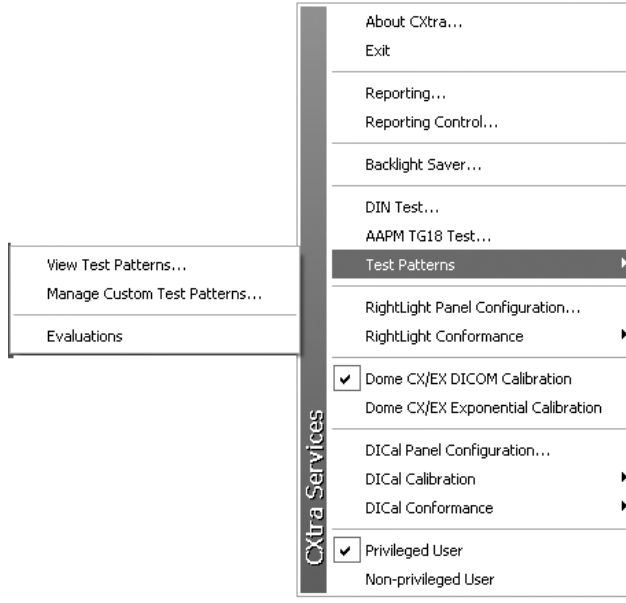
5 Click OK to save any changes, close the dialog, and close the test pattern (if displayed).

Dome Visual and Interactive Evaluations

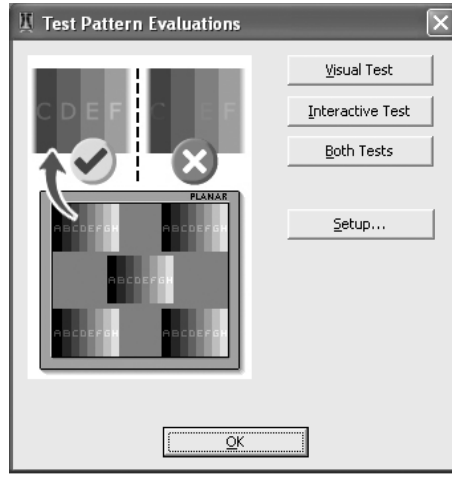
The evaluations help you assess the image quality of the display panels at various locations and for various shades of gray. These tests can be launched manually or scheduled to run at specific times on local Dome CXtra-enabled workstations. The tests can also be forced from the Dome Dashboard application on a remote workstation.

When launched, these tests run sequentially on all supported displays. Upon the completion of the tests, the results are logged into Reporting History. If any test fails on any of the displays, it is represented as a warning. The Dome CXtra status icon also changes correspondingly.

The tests can be accessed via the Dome CXtra Services menu > Test Patterns > Evaluations.



When invoked, the Test Patterns Evaluation dialog allows you to run the Dome Visual Test or the Dome Interactive Test or both. Use Setup to configure test parameters.



Run Dome Visual Test

Use this test to display a visual pattern that you have selected (on the Setup dialog) and make a response to the resolution, uniformity, and visibility of details present in the pattern. The pass/fail status of the test is determined by your responses to the test questions.

Run Dome Interactive Test

With the interactive test, you can decipher textual strings that are shown on a background with very little contrast difference, 5 percent. A randomly generated alphabet string of 8 characters is shown over a background pattern. You are expected to read this string and enter it into the field provided. If the string that you enter does not match the string shown, the test fails and you are given one more chance to take the test. When a second test is run, the results of both tests are logged into Reporting History.

Run Both Tests

This option runs both tests on all supported displays connected to the Dome CXtra-enabled workstation. The Dome Visual Test runs first on the displays, followed by the Dome Interactive Test.

After the test is run, a Test Complete dialog appears where you are prompted to enter your name (configurable) and have the option to view or save the report. Results are also logged into the Reporting service and can be viewed from Reporting > History.

Test Modes

Immediate. You can manually perform either test or both tests using the Evaluations command: Dome CXtra Services menu > Test Patterns > Evaluations.

Scheduled. You can schedule a test either locally on the Dome CXtra-enabled workstation or remotely from the Dome Dashboard console. Either tests or both tests can be scheduled. If you are using the Dome Dashboard software, you can override the local Dome CXtra settings with the settings in the Dome Dashboard application.

When a scheduled test pops up, the Preparing to Show Test Pattern dialog prompts you to select one of three options: taking the test, canceling the test, or postponing the test for a later time. If you decide to take the test later, the dialog pops up again after a time specified on the General tab of the Setup dialog.

NOTE: Scheduled test do not pop up if any of the Test Patterns dialogs are open.

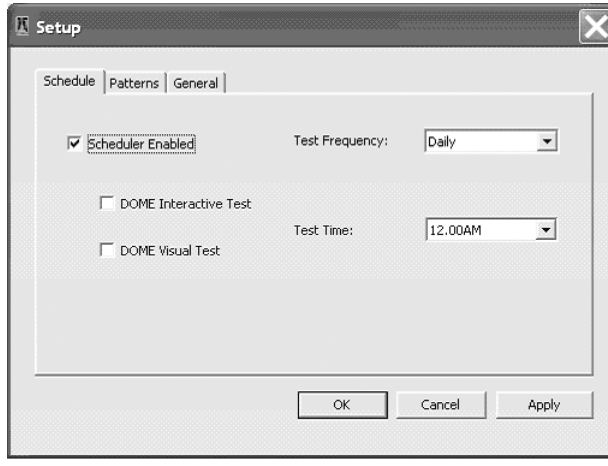
Forced. Either tests or both tests can be forced from the Dome Dashboard console on targeted Dome CXtra-enabled workstation. Start the test when it pops up.

Setup

Setup allows you to configure the parameters related to test scheduling, pattern selection, and other general parameters. The Setup dialog include three categories: Schedule, Patterns, and General.

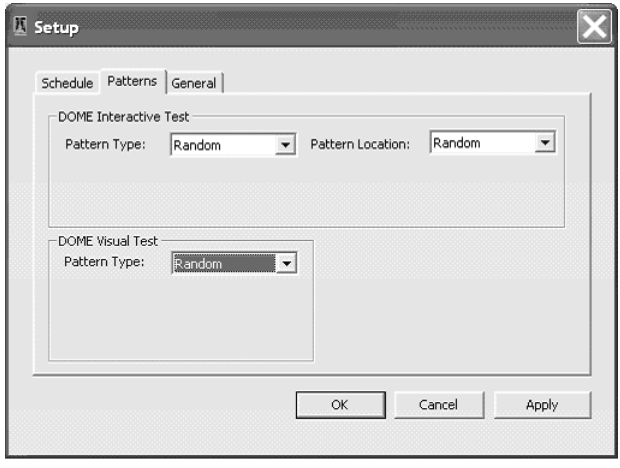
Schedule. Open this tab to select the test time, test frequency, and the tests to be scheduled.

You can select the test to be scheduled and set the schedule by frequency and time. The scheduled tests pop up at the Dome CXtra-enabled workstation at the specified test time. Test time is scaled by 30-minute intervals.



Patterns. Open this tab to configure the pattern type and location for the Dome Interactive Test and the pattern type for the Dome Visual Test.

NOTE: Random is the default selection for all parameters of each test.



Four types of patterns are supported by the Dome Interactive Test.

- Eight step gradation from white to black
- Eight step gradation from black to white
- Eight step gradation from black to gray
- Eight step gradation from gray to black

Each gradation has a random character in which the gray shade is 5% more or less than the background gradation gray shade.

When Random pattern type is used by default or choice, you see a randomly selected pattern each time the test is invoked. You can place these patterns at the following locations on the display panel, or in a random location.

- Top right
- Top left
- Bottom right
- Bottom left
- Center

When Random pattern location is used by default or choice, you see the pattern in a random location each time the test is invoked.

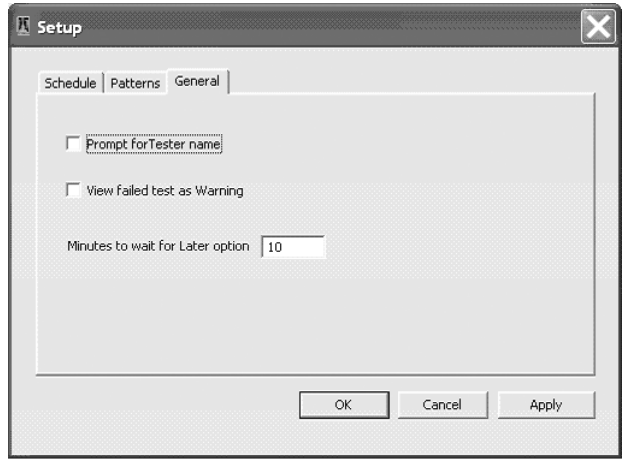
These six patterns are supported by the Dome Visual Test:

- SMPTE
- TG18-QC
- TG18-CT
- TG18-GV
- DIN-1
- DIN-2

When Random pattern type is used by default or choice, you see a randomly selected pattern each time the test is invoked.

Open this tab to configure these three parameters:

- Prompt for Tester name: Enter your name after test completion. If this option is disabled, the software labels the user "Anonymous."
- View failed test as warning: Set the message box to report test failure as a warning dialog or an information dialog.
- Minutes to wait for Later option: Configure the time in minutes for the test to reappear. This function is active when you select the Later option in the Preparing to Show dialog.



Backlight Saver Service

The Backlight Saver service allows you to specify when the display system turns off the panel backlights to extend the display's clinical life. This service allows you to specify an inactivity value in minutes, and the panel backlights turn off whenever a period of inactivity exceeds this value.

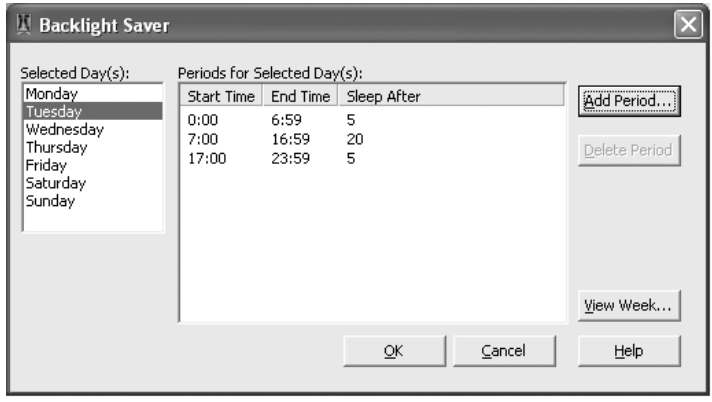
The service lets you define one or more "saver periods" during each day of the week. You can specify a different inactivity or "sleep after" value for each saver period you define.

CAUTION: The Backlight Saver service controls Window power options only within defined periods. During undefined periods, Windows power options and screen saver are being used.

Creating a Saver Period

To create a saver period for selected days

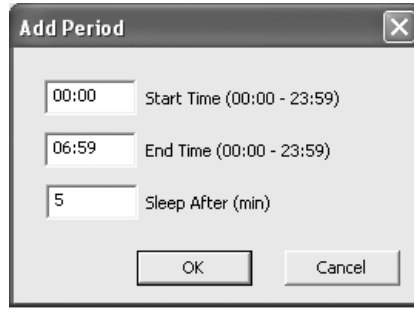
1 Open the Dome CXtra menu and select Backlight Saver.



2 Select the day or days for which you want to create one or more saver periods.

Click a single day name in the Selected Day column or hold down the Control key while clicking multiple days. For example, you might specify the same saver periods for weekdays (Monday through Friday) and different saver periods for weekends.

3 Click Add Period.



4 Define a saver period by entering values for Start Time and End Time. Entries must be in a 24-hour format.

NOTE. Be sure the saver period does not overlap a period created earlier.

5 Enter an integer value to define the Sleep After parameter in minutes. During this saver period, the backlight turns off when a period of inactivity exceeds this time.

6 Click OK. The new saver period appears in the Periods for Selected Day(s) text field of the Backlight Saver window.

7 Define additional saver periods by repeating steps 2 to 6.

If necessary, you can define a saver period to cover the entire 24 hours in a given day.

The panel backlight is controlled by the selected Windows power scheme during the hours not included in defined Backlight Saver periods.

8 Click OK.

Deleting a Saver Period

To delete an existing saver period

1 Open the Dome CXtra Services menu and select Backlight Saver.

2 Click the associated data line and then click Delete Period.

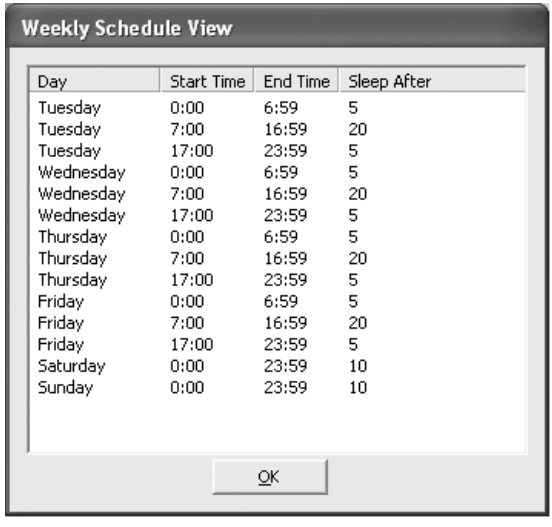
Viewing Schedule for Week

To view the saver periods for a week

1 Open the Dome CXtra Services menu and select Backlight Saver.

2 Click View Week to see the schedule.

3 Click OK.



DIN Test Service

The DIN Test service tests your Dome CX, Dome EX, and Dome QX displays for conformance with German standard DIN 6868-57. A successful acceptance test such as the one performed by DIN Test service is mandatory before DIN 6868-57 application category A and B devices* can be accepted in a hospital or other diagnostic setting.

For more information about DIN acceptance criteria, obtain a copy of the DIN 6868-57 standard through the following web site:

http://www2.din.de.

Besides acceptance testing, the DIN Test service provides constancy testing. Constancy tests can be performed periodically after successful acceptance testing to detect any degradation in display performance. The tests detect degradation by measuring deviation from performance values recorded during the acceptance test.

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* Application category A includes image display devices for the diagnosis of digital images taken by means of projection radiography, including storage phosphors or solid-state detectors, for example, of the skeleton, thorax or mamma. However, image display devices for the diagnosis of digital images from dental radiography, fluoroscopy, or subtraction angiography are not included in application category A.

Application category B includes all image display devices suitable for the diagnosis of digital images from dental radiography, fluoroscopy, and subtraction angiography as well as of images generated by means of sectional imaging procedures (such as computed tomography, magnetic resonance tomography, sonography) and nuclear-medical procedures.

Acceptance or constancy testing requires a photometer for measuring the luminance of the display. The DIN Test service automatically reads luminance measurements when you use one of these photometers:

- Wellhofer LXplus
- Minolta LS-100

NOTE: The NDSsi photometer is also read automatically, but it is a contact device and is less suited for use in DIN testing.

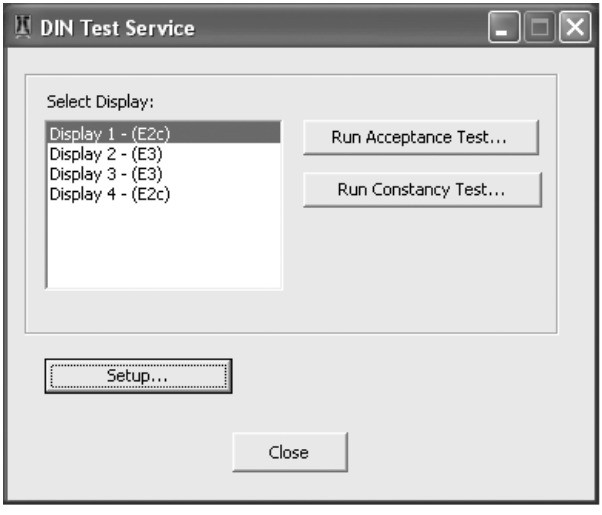
You can use other photometers that meet the requirements of a DIN evaluation, but you must manually enter the photometer measurements during the tests.

Setting Up for Testing

The DIN Test service presents a wizard that helps you determine whether the selected display device meets the DIN standard. Part of this process involves taking measurements with a photometer and comparing the measurements with the DIN standard.

To set up the display for testing

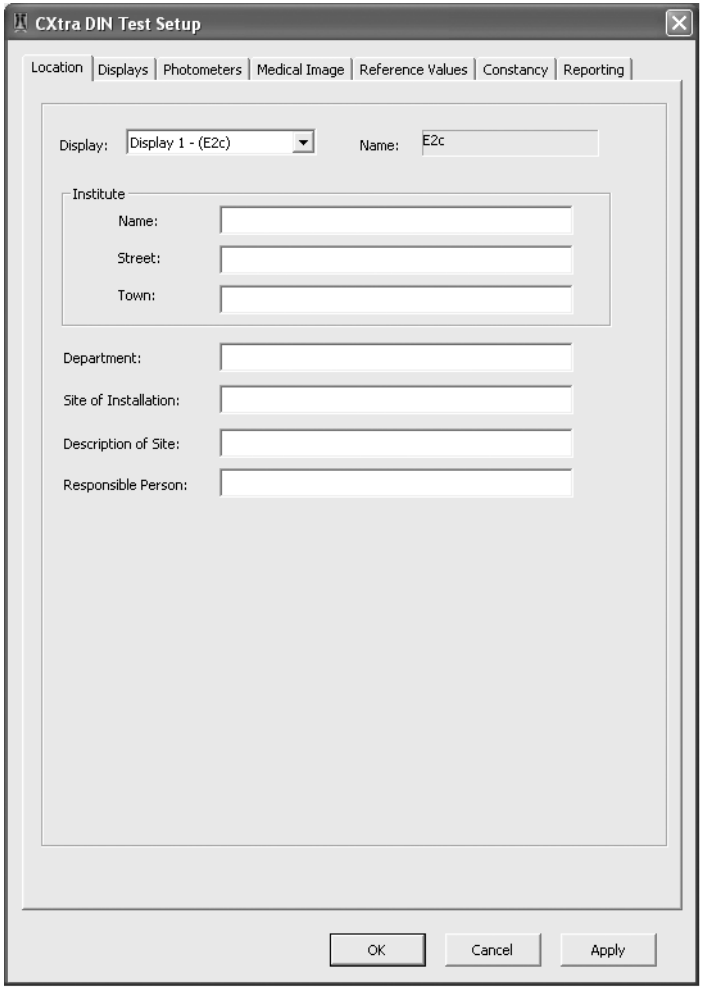
1 Open the Dome CXtra Services menu and select DIN Test. The DIN Test service dialog appears.



2 Click Setup. The DIN Test Setup dialog appears, open to the Location tab.

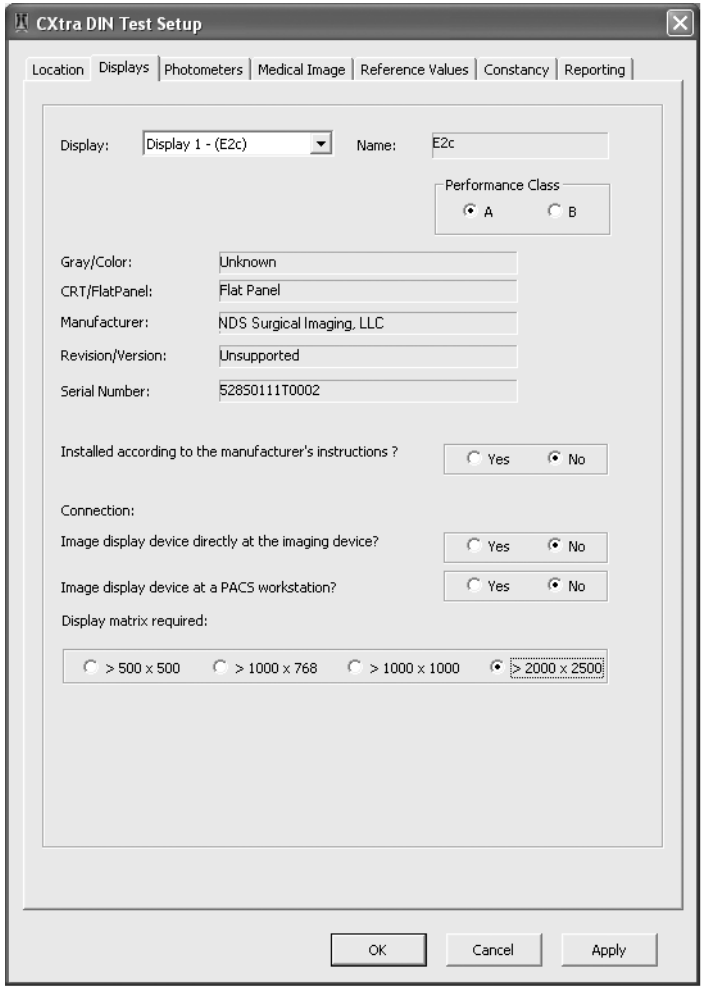
To set up entries on the Location tab

Enter descriptive text and click Apply.



To set up entries on the Display tab

1 Complete the Display and Performance Class fields.

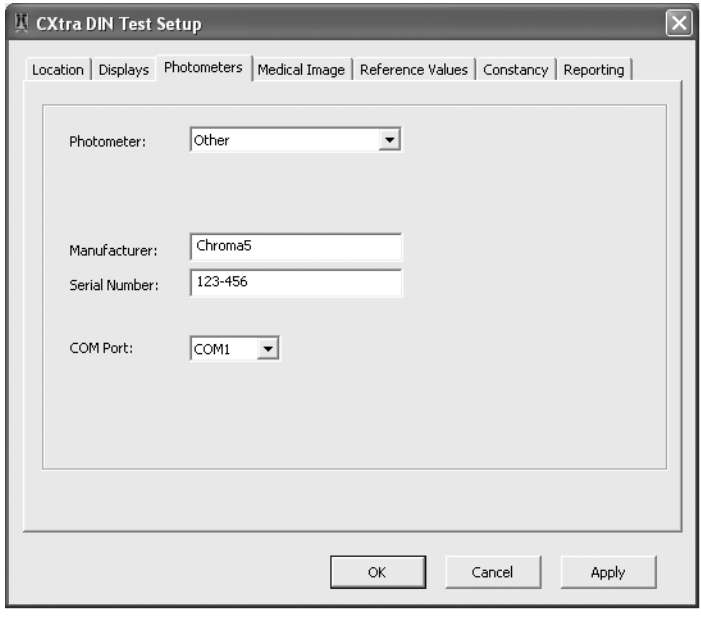


2 Select Yes or No for the three installation questions, select the display matrix require, and click Apply.

NOTE: The descriptive information in the middle of the display is read-only and cannot be changed.

To set up entries on the Photometers tab

1 Select a photometer from the pull-down list. Select Other if your photometer is omitted from the list.



NOTE: All photometers must adhere to section 7.1 of the DIN specification. When you select Other, you must manually enter the measured values in the test wizard dialogs.

2 If you selected Other in step 1, type the name of the photometer manufacturer in the Manufacturer field.

3 Enter the photometer serial number in the Serial Number field.

4 On the COM Port pull-down list, select the COM port used to connect the photometer to the computer.

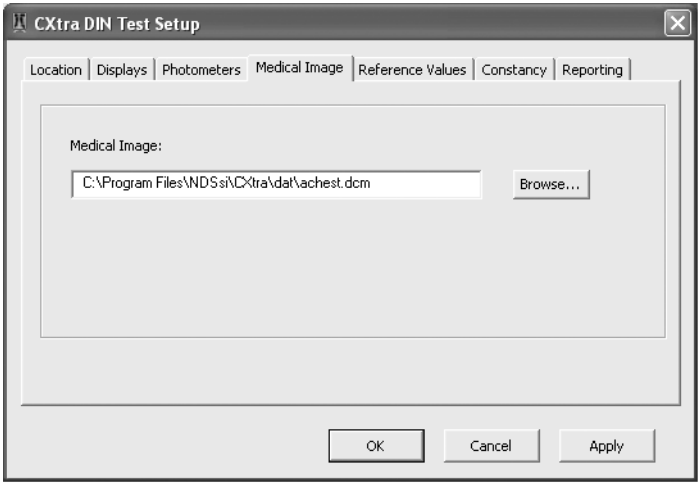
5 Click Apply.

If you selected Other in step 1, a message reminds you to manually enter measurement values while conducting the tests. Click OK to close the message.

To set up entries on the Medical Image tab

To use an image other than the default image (achest.dcm), click Browse and select an image. Click Apply.

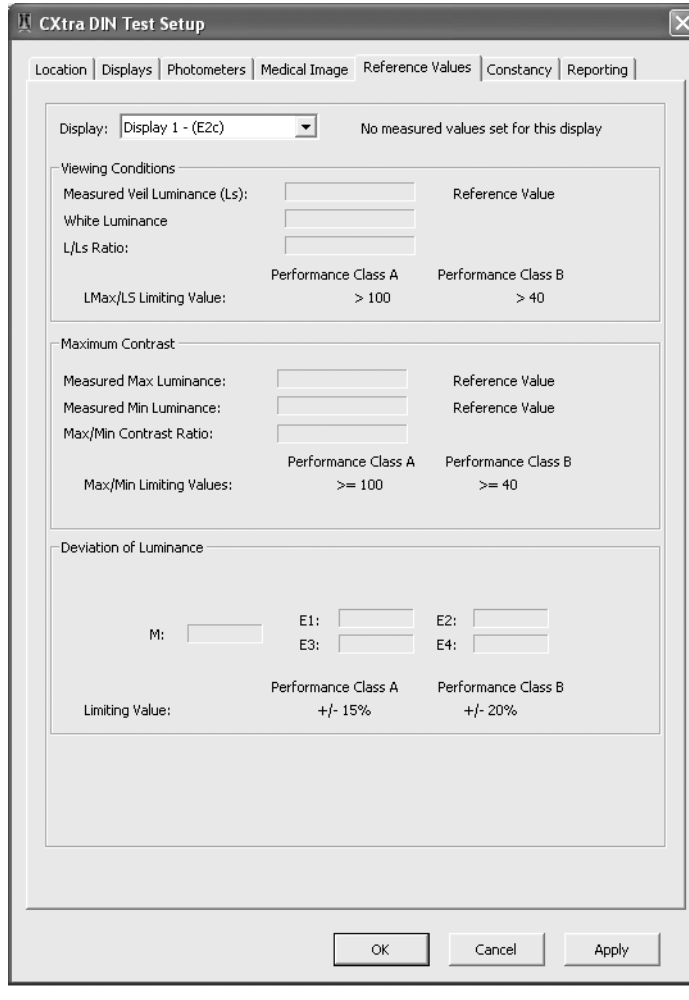
NOTE: A landscape image, chestah.dcm, is available in the installation folder's dat folder.



To view information on the Reference Values tab

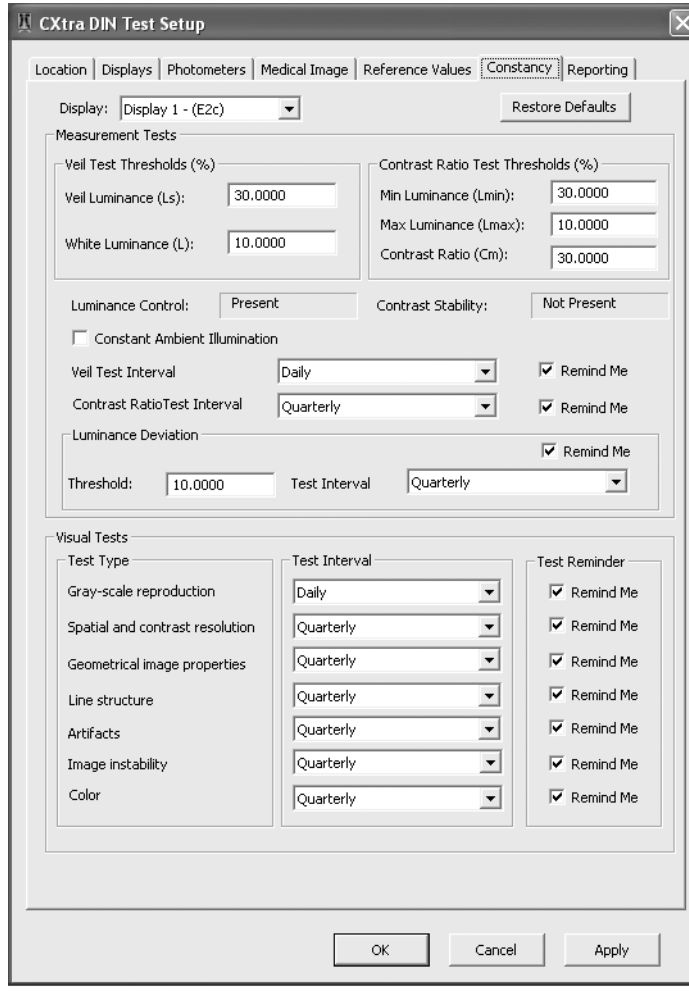
Open the Reference Values tab to view information about the most recent successful DIN acceptance test. Click Apply.

NOTE: This information is read-only.



To set up entries on the Constancy tab

1 Open the Constancy tab to set DIN constancy test parameters. The tab shows the previously saved constancy settings for the display identified in the Display field.



2 To use the settings in the DIN constancy specification (recommended), click Restore Defaults.

NOTE: Using the default settings is recommended to assure conformance with the DIN specification.

The default values for Veil Test Interval and the Contrast Ratio Test Interval depend on whether Luminance Control and Contrast Stability are shown as Present or Not Present. They also depend on whether you enable Constant Ambient Illumination. (Luminance Control always appears as Present for Dome CX and Dome EX displays and Not Present for Dome QX displays. Contrast Stability is always shown as Not Present for both display types.)

3 To use thresholds and test intervals other than those in the DIN specification (not recommended), change them as desired in the Measurement Tests and Visual Tests sections of the tab.

NOTE: Do not use thresholds greater than 50%.

4 To create a reminder entry in the history log and change the Dome CXtra icon on the taskbar to warning status when a test interval is exceeded, click the Remind Me box next to the test. (The warning icon is shown on page 10.)

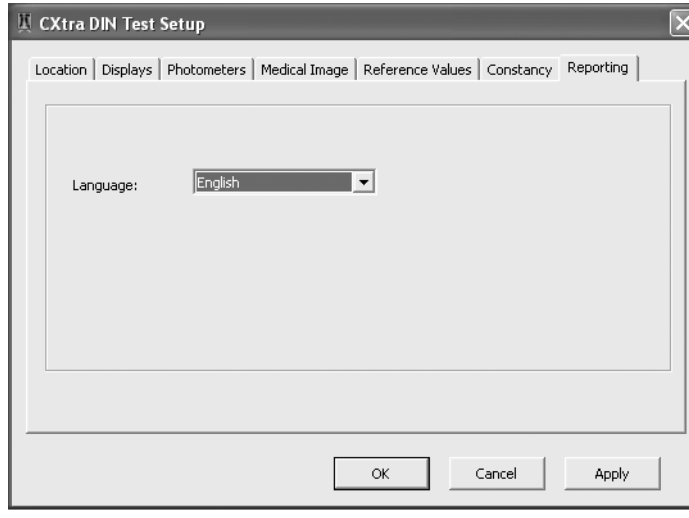
5 Click Apply to accept the values on the tab, or click OK to accept the values and close the DIN Test Setup dialog.

If you used any non-default setting or value, a warning message appears when you click Apply or OK.

To specify language on the Reporting tab

1 Open the Reporting tab and select your language, English or German.

2 Click Apply or OK.



Running a DIN Acceptance Test

If the Privilege service is installed, you must log on as a privileged user before you run a DIN acceptance test. (See page 96.)

To run a DIN acceptance test

1 Open the Dome CXtra Services menu and select DIN Test.
The DIN Test service dialog appears.

2 Click Run Acceptance Test.

3 Using the photometer identified in the setup procedure, follow the instructions provided by the test wizard.

NOTE: For photometers not identified by name on the setup pull-down list, type the photometer readings into the field provided in the test wizard dialogs.

4 After completing the last wizard dialog, click Finish.

If the test was successful, a message prompts you to save the measured values as reference values.

5 To save the measured values on the Reference Values tab of the Setup dialog, click Yes.

To continue without saving the measured values as reference values, click No.

6 In the Test Complete dialog that appears, type your name in the name field.

7 Click Save Report.

8 To view the results of the test immediately, click View Report.

To view the results at a later time, see "Viewing DIN Test Results" on page 83.

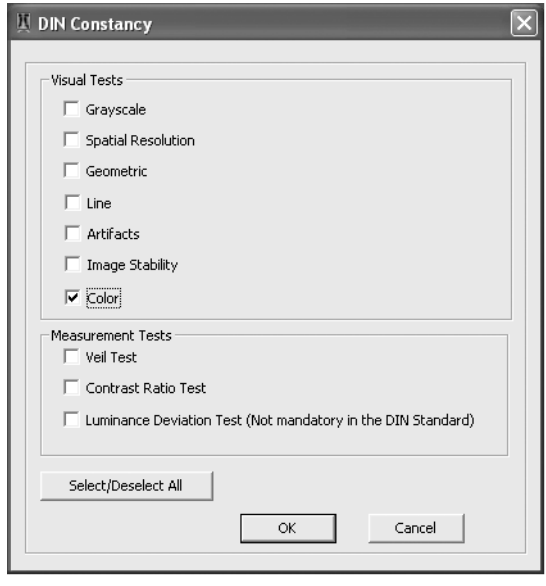
Running a DIN Constancy Test

You must successfully run a DIN acceptance test (described in the previous section) on the device being tested before you can run the constancy test described below. If the Privilege service is installed, you must log on as a privileged user before you run a DIN constancy test. (See page 96.)

To run a DIN constancy test

1 Open the Dome CXtra Services menu and select DIN Test

2 Click Run Constancy Test to open the test selection dialog.



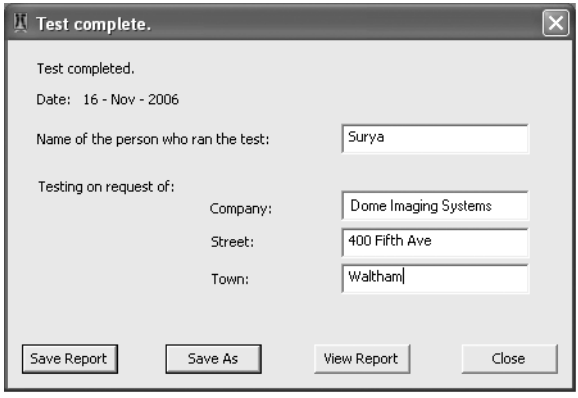
3 Select the constancy tests you want to run, and then click OK.

4 Using the photometer identified in the setup procedure, follow the instructions provided by the test wizard.

NOTE: For photometers not identified by name on the setup pull-down list, type the photometer reading into the fields provided in the test wizard dialogs.

5 After completing the last wizard dialog, click Finish.

6 In the Test Complete dialog that appears, type your name in the Name field and enter the name and location of the organization requesting the test.



7 Click Save Report.

NOTE: Click Save As to store the report as an RTF file at a specified location on your hard drive. In this format, you can use common word-processing applications such Microsoft Word or Wordpad to view the report, or attach the file to e-mail transmissions.

8 To view the results of the test immediately, click View Report.

To view the results at another time, see "Viewing DIN Test Results" on page 83.

Viewing DIN Test Results

When you click Save Report after running a DIN acceptance or constancy test, the results are recorded in the history log. You can use the Reporting service to view the results at any time with the following steps:

1 Open the Dome CXtra Services menu and select Reporting.

2 Click the History tab.

3 Click the line corresponding to the test results you want to view, and then click View Detail.

AAPM TG18 Test Service

The AAPM TG18 Test service supports the testing of Dome CX, Dome EX, and Dome QX displays in accordance with the recommendations of the American Association of Physicists in Medicine Task Group 18. The evaluations supported by this service are fully described in the AAPM TG18 document. Obtain a copy of the document at this URLS:

http://deckard.mc.duke.edu/~samei/tg18.

If you have the Privilege service installed, you must log on as a privileged user to use this service.

The AAPM TG18 document describes many characteristics of electronic display devices and the factors that affect the quality of displayed images. As an integral part of this discussion, the task group defines evaluations that you can use to measure the various characteristics of your display device. The task group recommends a test consisting of several evaluations for acceptance testing to ensure a new display initially provides image quality suitable for the healthcare environment. For ongoing maintenance, the report recommends daily, monthly/quarterly, and annual tests to be sure the display continues to display the same image quality.

The TG18 Test service helps you complete various evaluations recommended by the task group. To help you complete a test suite (set of evaluations), the TG18 Test presents a wizard that briefly describe the basic steps you must complete for each evaluation in a test. When an evaluation requires a subjective evaluation of a test pattern, the wizard explains the criteria for satisfactory display performance.

Warning. Successful completion of a TG18 Test frequently requires preparing the display and the environment in accordance with applicable sections of the TG18 document. The wizard used by the TG18 Test for each evaluation provides only an outline of the basic test steps. It does not describe all prerequisite conditions and detailed information required to perform the evaluation.

You can define the test that you want to complete for acceptance, plus routine daily, monthly/quarterly, and annual tests. The Dome CXtra system can notify you when each test is scheduled to be run. Each test is predefined in accordance with TG18 recommendations. You have the option of changing the evaluations included in any test.

Completing many of the TG18 evaluations for a Dome CX or Dome EX display requires a spot photometer designed for use with LCD panels. The TG18 Test supports the following photometers:

- Wellhofer LXplus
- Minolta LS-100

The TG18 Test service automatically reads measurements from these supported photometers. You can use other photometers that meet the requirements of a TG18 evaluation, but you must manually enter measurements during procedures requiring a photometer.

NOTE: The NDSsi photometer is also read automatically, but it is a contact device and is less suited for use in TG18 testing.

Before you can use the TG18 Test, you must complete a setup process. During the setup process, you need to identify your display panels and the photometer you have installed. You can then review the default evaluations in each of the following test suites and make changes if necessary:

- Daily
- Monthly/Quarterly
- Annual
- Acceptance

You should be thoroughly familiar with the TG18 recommendations for each of these tests, as well as the policies of your organization related to the testing of display panels.

AAPM TG18 Test Setup

You must complete at least part of the setup procedure before you use the TG18 Test to run a test on any display. During initial setup, specify a number of operating parameters within these categories on the Setup Information dialog:

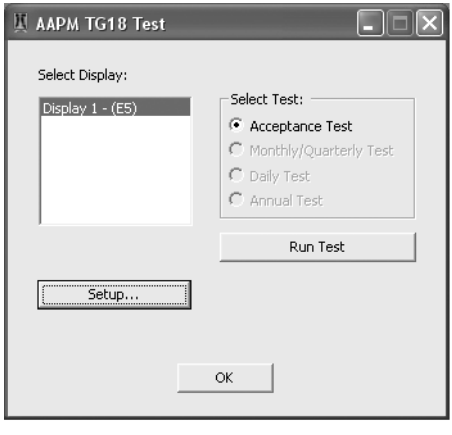
- Photometers
- Configuration
- Location
- Displays
- Reminders

Review and change the operating parameters at any time to meet changes in equipment or required testing.

Before starting the setup procedure, install a photometer on your computer that meets the requirements of evaluations you plan to complete. You need the photometer serial number and the number of the COM port used by the device.

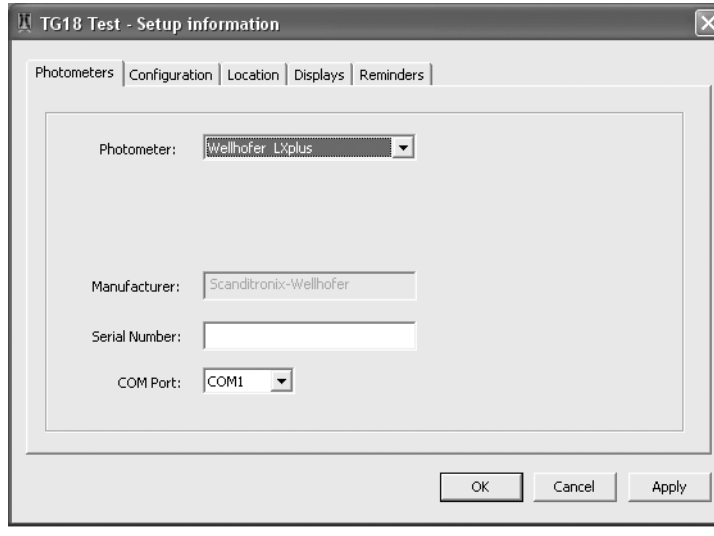
To access the Setup Information dialog

1 Select AAPM TG18 Test on the Dome CXtra Services menu.
The TG18 Test dialog appears.



NOTE: The Monthly/Quarterly, Daily, and Annual Test options are disabled until you run an Acceptance Test.

2 Click Setup. The Photometers tab of the TG18 Test Setup Information dialog appears.



To set up entries on the Photometers tab

1 If you have a supported photometer installed, select the model name on the Photometer pull-down list. Otherwise, select Other. If you select a supported photometer, the system automatically lists the manufacturer's name in the field provided.

2 If you selected Other, type the manufacturer's name.

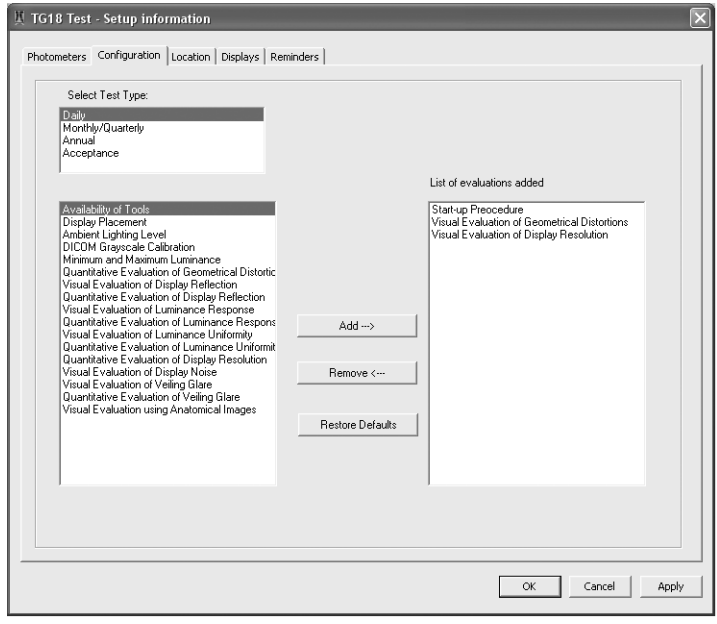
3 Enter the photometer serial number.

4 Select the COM port used to connect the photometer to the computer on the COM Port pull-down list.

5 Click Apply. If you are not using a supported photometer, a system warning message explains that you must manually enter measurement values while completing tests. Click OK.

To set up entries on the Configuration tab

1 Open the Configuration tab to view and modify default evaluations for each test listed.



You can replace the defaults for any test with any combination of listed evaluations. The number sequence following each evaluation name is the paragraph number that describes the evaluation in the TG18 document.

2 Select a test in the Select Test to Configure list. During an initial setup, the system automatically selects recommended evaluations for a test by checking in the selection box next to each evaluation name. If the test was redefined during previous setup activity, the system shows the evaluations currently selected.

- Add or delete an evaluation by toggling a check mark in or out of the selection box.

- Click Select/Deselect All to toggle check marks for all evaluations. Click Restore Defaults to replace current selections with the AAPM Task Group recommended evaluations. Before replacing current selections, the system shows a warning message. You can proceed to replace current evaluation selections.

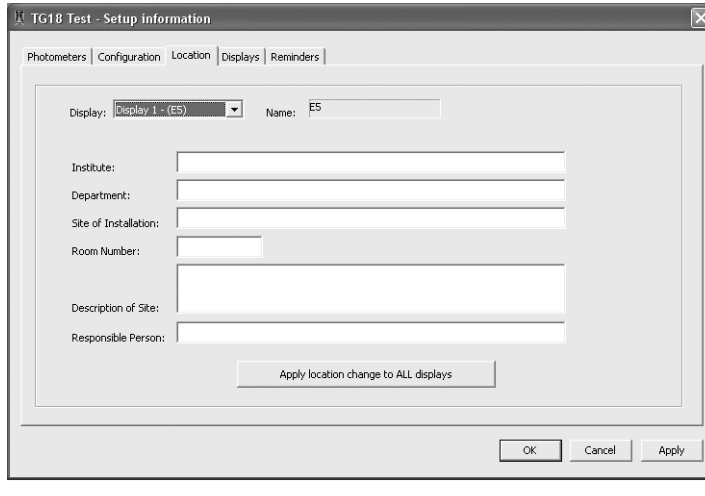
CAUTION: Clicking Restore Defaults replaces custom evaluation selections for all four tests, not just the currently selected test

3 Repeat steps 1 and 2 for each test.

4 Click Apply.

To set up entries on the Location tab

1 Open the Location tab to select a display in the Display pull-down list. The system lists a name in the field to the right if the display is a recognized type.



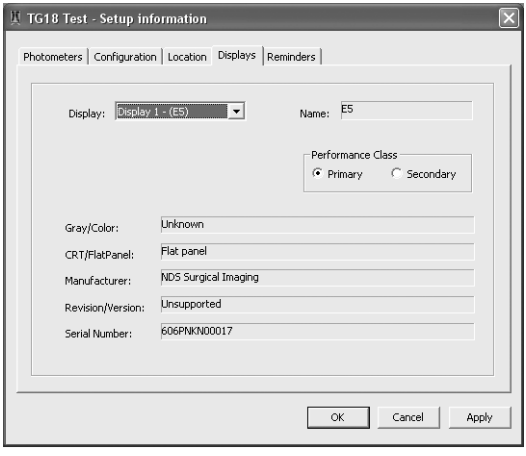
2 Fill in the fields provided.

- If you want the same information saved for each display on the system, click Apply location information to ALL displays.
- If you are entering different information for another display on the system, select the display from the list, complete the fields, and click Apply.

To set up entries on the Displays tab

Review the characteristics of each display panel connected to the computer. You can indicate how each panel is used by selecting a performance class as described below.

1 Click the Displays tab.



2 Select a display in the Display pull-down list. The system supplies values for the attributes shown, if known.

3 Designate the selected display as Primary or Secondary performance class by clicking the appropriate radio button.

Designate a display as Primary (Class A) if it is used for medical interpretation. All other displays should be designated Secondary (Class B). The default designation is Primary.

4 Repeat steps 2 and 3 for each display.

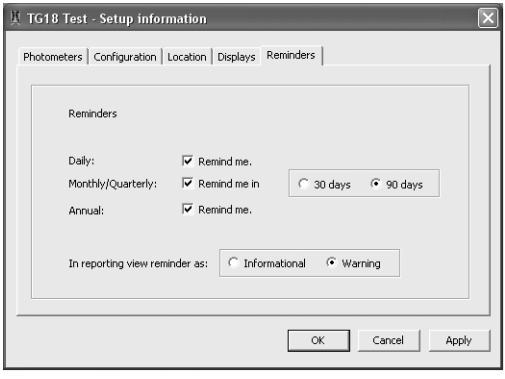
5 Click Apply.

To set up entries on the Reminders tab

Schedule optional reminders for completing tests other than acceptance. For example, if you specify a reminder for the daily test suite, the system automatically generates a reminder message for each display that you have not tested.

Dome CXtra provides reminders for only those tests that are enabled. The routine tests (daily, monthly, annual) are not enabled until an acceptance test has been completed for a given display and the report saved for a given display.

1 Click the Reminder tab.



2 Toggle a check mark into the selection box for each reminder period you want. If you select Monthly/Quarterly, you also need to indicate how often you want to complete this suite — every 30 days (monthly) or every 90 days (quarterly).

3 Select the type of reminder message you want to receive — Informational or Warning.

Selecting the Informational reminder adds a reminder event to the History log for each display at the intervals specified. Selecting the Warning reminder causes a message box to appear on your screen. In addition, the reminder event changes the Dome CXtra icon in the system tray and adds an entry into the History log for each display.

If the reminder is issued as a warning, a status change trap is sent to the SNMP console. See "SNMP Management Console" on page 105 for more information.

4 Click Apply or OK.

Completing AAPM TG18 Tests

You can complete the following tests for each display:

- Acceptance Test – A non-scheduled set of evaluations used to determine if the performance of a new display panel is satisfactory.
- Monthly/Quarterly Test – A set of evaluations that you can choose to complete at 30- or 90-day intervals.
- Daily Test – Evaluations you want to complete every day.
- Annual Test – Evaluations completed only once a year.

The routine tests (daily, monthly, annual) are not enabled until the acceptance test has been completed and the report has been saved for a given display.

By default, the system assigns evaluations to each test based on the TG18 recommendations. You can use the Configuration tab to change the evaluations assigned to any test suites. See "To set up entries on the Configuration tab" on page 88 for more information on viewing and changing assigned evaluations.

To run a test

1 Open the Dome CXtra Services menu and select AAPM TG18 Test.

2 Select a display panel in the Select Display list.

3 Select a test in the Select Test list box.

4 Click Run Test to access the wizard, which prompts you to complete each evaluation in the test. Where necessary, you enter measurement or evaluation data as you complete each evaluation.

   NOTE: Some evaluations require you to complete multiple wizard dialogs. The Skip button at the bottom of each wizard dialog moves to the next evaluation and not to the next dialog in the current evaluation.

   After completing all evaluations in the test, you have options to view and save a report.

Viewing AAPM TG18 Test Results

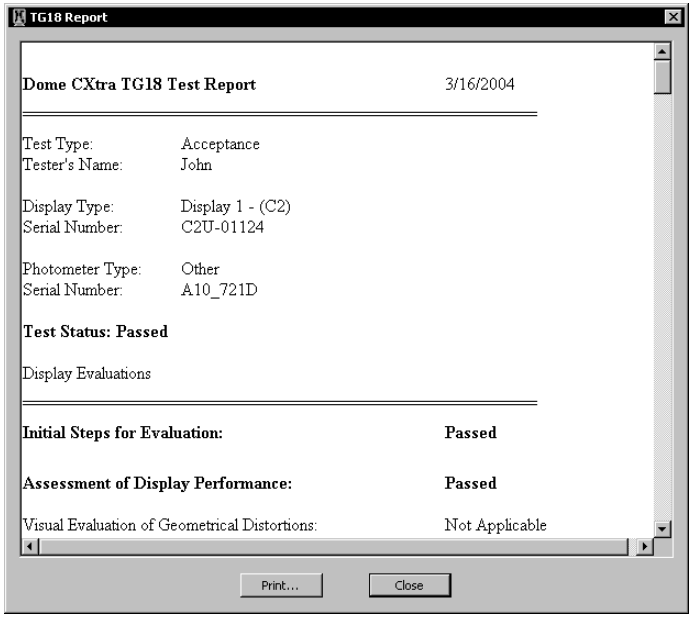
You can view the test results for a TG18 Test immediately after completing all evaluations. The Test Info dialog appears upon completion of a test.

Enter your name in the Tester's Name field and your organization name in the Tester's Company field. Then pick among these options for viewing or saving the report:

- Click View Report for a summary of evaluations completed.
- Click Save Report to store the information.
- Click Save As to store the information as an RTF file at a specified location on your hard drive. In this format, you can use common word-processing applications such Microsoft Word or Wordpad to view the report, or attach the file to e-mail transmissions.

You must save the report for the test to be added to the History log. Reminders only work for a given test if the test report is saved. Unless you save the report, you have no indication that the test was run.

When you click Save Report, Dome CXtra records the test event in the History log. You can then use the Reporting service to view events in the History log. Select the TG18 Test event in the log and click View Detail to review saved test results.



Privilege Service

The Privilege service allows only privileged users and administrators to change the operating parameters of the display system. All others, called non-privileged users, are limited to viewing status information and the current operating parameter values.

Logging On as Privileged User/Administrator

NOTE: Passwords are case-insensitive. You can change the password by following the instructions on page 97.

To log onto Dome CXtra as a privileged user/administrator

1 Open the Dome CXtra Services menu and select Privileged User. The Privileged Logon dialog opens.

2 Select either Administrator or Privileged in the Privilege field.

3 Enter your user password in the Password field.
(The default password for privileged user is CXtra.
The default password for administrator is CXtraAdmin).

4 To start Dome CXtra in the privileged user mode when the computer starts and without entering a password, click the "Start as privileged user" box. To start Dome CXtra in the non-privileged user mode when the computer starts, leave the box unchecked.

5 To allow non-privileged users to exit from the Dome CXtra application, click the "Allow non-privileged users to exit" box.

6 Click OK to close the dialog.

Logging Out of Privileged Mode

To prevent unauthorized users from changing Dome CXtra settings, log out when leaving the system unattended.

To log out

Open the Dome CXtra Services menu and select Non-Privileged User.

Changing Your Password

To change your privileged user password

1 Open the Dome CXtra Services menu and select Privileged User to open the Privileged Logon dialog.

2 Click Change to open the Change Password dialog.

3 Enter your current password in the Old Password field.

4 Enter your new password in the New Password field

5 Enter your new password again in the Confirm New field.

6 Click OK to close the dialog and activate your new password.

Reporting Service

The Reporting service records and displays properties and events related to Dome CXtra services installed for your display system. Properties include information about which services and versions are installed. Events are status messages transmitted at regular intervals by each Dome CXtra service.

Events are recorded in the History log. The log contains routine events and error messages and events useful in troubleshooting system error conditions.

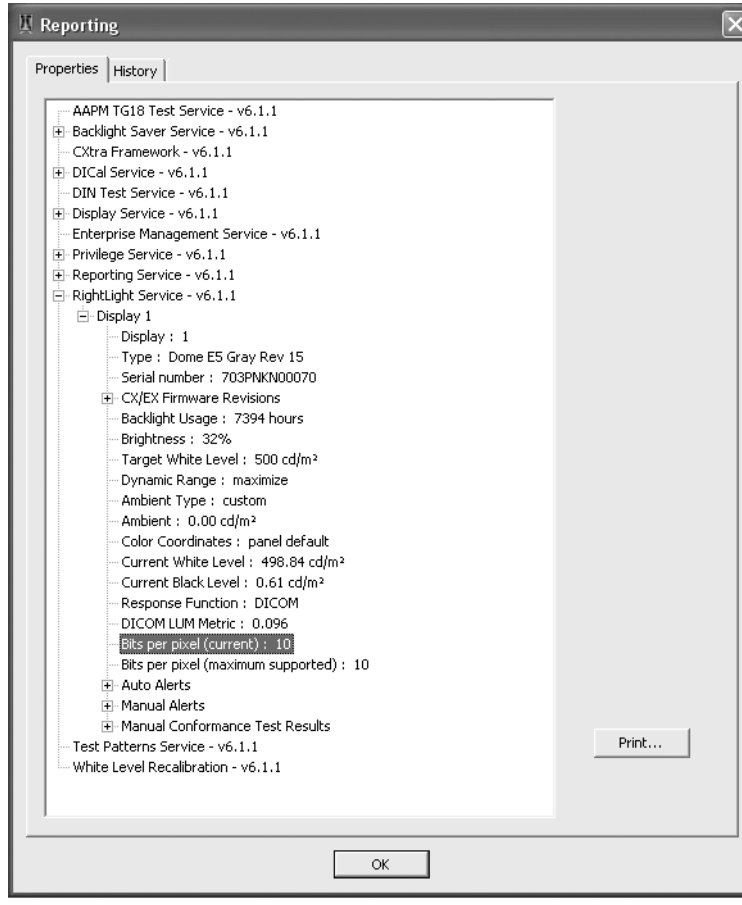
NOTE: The Reporting, Backlight Saver, and Privilege services do not create History events.

Viewing Reports

Open the Dome CXtra Services menu and select Reporting.

The Reporting window contains two tabs: Properties and History.

Properties Tab

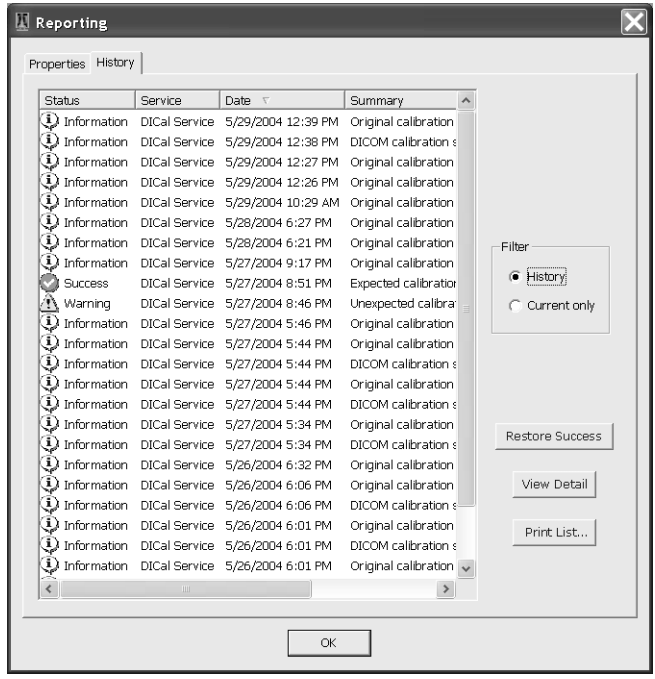

Reporting
Properties
History
AAPM TG18 Test Service - v6.1.1
Backlight Saver Service - v6.1.1
CXtra Framework - v6.1.1
DICal Service - v6.1.1
DIN Test Service - v6.1.1
Display Service - v6.1.1
Enterprise Management Service - v6.1.1
Privilege Service - v6.1.1
Reporting Service - v6.1.1
RightLight Service - v6.1.1
Display 1
Display : 1
Type : Dome E5 Gray Rev 15
Serial number : 703PNKN00070
CX/EX Firmware Revisions
Backlight Usage : 7394 hours
Brightness : 32%
Target White Level : 500 cd/m²
Dynamic Range : maximize
Ambient Type : custom
Ambient : 0.00 cd/m²
Color Coordinates : panel default
Current White Level : 498.84 cd/m²
Current Black Level : 0.61 cd/m²
Response Function : DICOM
DICOM LUM Metric : 0.096
Bits per pixel (current) : 10
Bits per pixel (maximum supported) : 10
Auto Alerts
Manual Alerts
Manual Conformance Test Results
Test Patterns Service - v6.1.1
White Level Recalibration - v6.1.1
Print...
OK

The Properties tab lists the Dome CXtra services installed and information about the display system components and operating parameters.

Click the plus sign (+) beside any heading to display subordinate items containing detailed information.

Check the display properties under the RightLight service to see both the current and the maximum supported bits per pixel.

History Tab


Reporting
Properties
History
Status
Service
Date
Summary
Information DICal Service 5/29/2004 12:39 PM Original calibration
Information DICal Service 5/29/2004 12:38 PM DICOM calibration s
Information DICal Service 5/29/2004 12:27 PM Original calibration
Information DICal Service 5/29/2004 12:26 PM Original calibration
Information DICal Service 5/29/2004 10:29 AM Original calibration
Information DICal Service 5/28/2004 6:27 PM Original calibration
Information DICal Service 5/28/2004 6:21 PM Original calibration
Information DICal Service 5/27/2004 9:17 PM Original calibration
Success DICal Service 5/27/2004 8:51 PM Expected calibratio
Warning DICal Service 5/27/2004 8:46 PM Unexpected calibra
Information DICal Service 5/27/2004 5:46 PM Original calibration
Information DICal Service 5/27/2004 5:44 PM Original calibration
Information DICal Service 5/27/2004 5:44 PM DICOM calibration s
Information DICal Service 5/27/2004 5:44 PM Original calibration
Information DICal Service 5/27/2004 5:44 PM DICOM calibration s
Information DICal Service 5/27/2004 5:34 PM Original calibration
Information DICal Service 5/27/2004 5:34 PM DICOM calibration s
Information DICal Service 5/26/2004 6:32 PM Original calibration
Information DICal Service 5/26/2004 6:06 PM Original calibration
Information DICal Service 5/26/2004 6:06 PM DICOM calibration s
Information DICal Service 5/26/2004 6:01 PM Original calibration
Information DICal Service 5/26/2004 6:01 PM DICOM calibration s
Information DICal Service 5/26/2004 6:01 PM Original calibration
Filter
History
Current only
Restore Success
View Detail
Print List...
OK

The History tab displays events recorded in the History event log. The events appearing in the History log are dependent on each service and typically record changes that may be useful for capturing history or troubleshooting an error condition.

Sorting the History Event Log

Each event is represented by a row of information with data shown in the following columns:

Status. An icon indicating the event type: Information, Success, System Error, or Warning.

Service. The Dome CXtra service associated with the event.

Date. Record of date and time of the event.

Summary. A brief event description.

Click a column heading to sort the event list based on the contents of that column. The list is initially displayed in reverse chronological order based on the Date (the most recent event at the top).

Display Selected Events - Filter

In the Filter section on the right side of the list, you can select Current Only to display only the most recent events. The alternative is to select History to display all events.

View Details

Select an event and click View Details to display detailed information in a message box if available. (Not all events have detailed information available.) You can also display this information by double-clicking the event.

Return to Success Status

To restore success mode if a current warning or error condition cannot be conveniently corrected, click Restore Success. This may be necessary, for example, if the display panel generating a warning has been removed from the system.

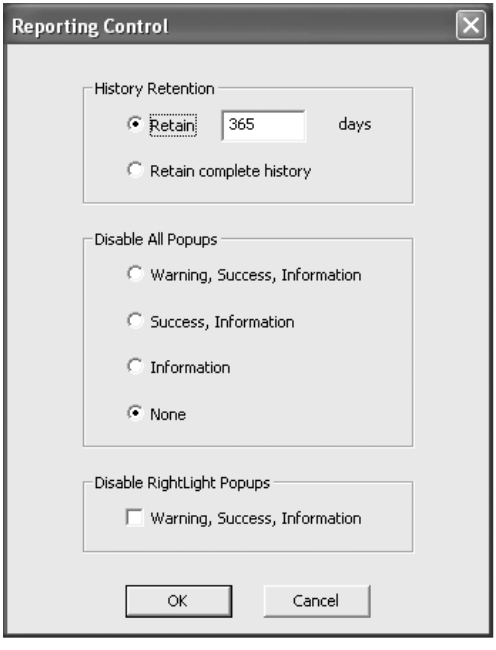
NOTE: Clicking Restore Success does not delete the warning or error. It adds a new, superseding event to the history.

Using the Reporting Control

The Reporting service allows you to specify the retention period for event information stored in the History log, and to suppress all or some alerts.

To view or change the retention period

Open the Dome CXtra Services menu and select Reporting Control.



Click Retain to save events for the specified number of days. Events older than the specified number of days are deleted unless Dome CXtra is in a warning or error status. You can change the number of days by entering an integer from 7 to 1000 in the days field. The default setting is 365 days (one year).

NOTE: If you are using Dome CXtra in conjunction with Dome Dashboard, you can exercise best practice by limiting history retention to 365 days (one year).

To retain event information indefinitely, select Retain Complete History. When this option is selected, event information is never deleted and the History log continues to lengthen as long as the Dome CXtra application is operating.

To suppress alerts

Use the selections in the Disable All Popups field to deactivate all, some, or none of the popups for all of the Dome CXtra software.

Check the box in the Disable RightLight Popups field to deactivate popups only in the RightLight service.

You can use the selections of both field to deactivate a combination or set of popups. For example, check the box in the Disable RightLight Popups field and select Information in the Disable All Popups field to deactivate all popups in the RightLight service as well as all Information popups from all other Dome CXtra services.

Enterprise Management Service

The Enterprise Management service allows you to manage medical imaging displays from a central location using Dome Dashboard software or standard Simple Network Management Protocol (SNMP) console applications such as Castle Rock™ SNMPc.

You must install the Enterprise Management service on each computer with a flat panel that you want to monitor and then use the information in this chapter to configure the SNMP service running on the computer.

SNMP Setup with Firewall Protection

Note the following for setting up the SNMP service with your system's firewall protection.

- For Windows 7 and Windows Server 2008 R2, be sure the SNMP service (on the exception list by default) is enabled.
- For Windows XP, add file snmp.exe to the Windows Firewall Exceptions list. The file is located in folder c:\windows\system32.
- For third-party firewall management, add file snmp.exe to the exception list of the application.

SNMP

To install the SNMP (Simple Network Management Protocol) service, have a system administrator decide on all settings to be sure this service operates in accordance with local network policies.

For information on installing SNMP, see "Configuring the SNMP Service" on page 106.

SNMP Management Console

You can use Dome Dashboard software or a console application on your computer to obtain the following types of information from each display running the Enterprise Management service in conjunction with the SNMP service:

- Hardware identification
- Current operating parameters
- Test results
- Status messages

From your management console, you can also reconfigure a display by changing selected operating parameters.

The Dome CXtra display agent is compatible with Dome Dashboard software and any SNMP console. The Enterprise Management service has been tested with Dome Dashboard software and the Castle Rock SNMPc console application.

The SNMP Model

Managing network components with SNMP is based on a manager/agent model. When managing a number of displays from a central location, the computer associated with each display is designated as the "agent." The SNMP console application running at the central location is designated as the "manager." Routine communications take place as a result of the manager polling each agent for information and occasionally changing a data item on the agent.

Each agent can also be configured to initiate communication with a manager as the result of a "trap" condition. Trap configuration defines the set of conditions that cause the agent to send a message, the message content, and the message recipient.

Configuring the SNMP Service

Use this section to configure the SNMP service on a computer running the Enterprise Management service.

Be sure the SNMP service is installed and operating on your computer. To confirm, open the Windows Control Panel, select Administrative Tools > Services and make sure SNMP service appears in the list of services.

To install the SNMP service

In Windows 7, open the Control Panel, next go to Programs, then Programs and Features. Open the Turn Windows features on or off dialog, and make sure the checkbox for SNMP Service is selected.

In Windows XP, open the Control Panel, then go to Add/Remove Windows Components to select Management and Monitoring Tools. Follow the instructions for installing the Simple Network Management Protocol. Configure the SNMP service.

To configure the SNMP service

You can configure the SNMP service automatically with the silent installation procedure. (See "Silent Install" on page 114.) Use the following procedure to configure the service manually.

1 Open the Service Properties dialog (page 107).

2 Enter traps information for handling trap messages (page 108).

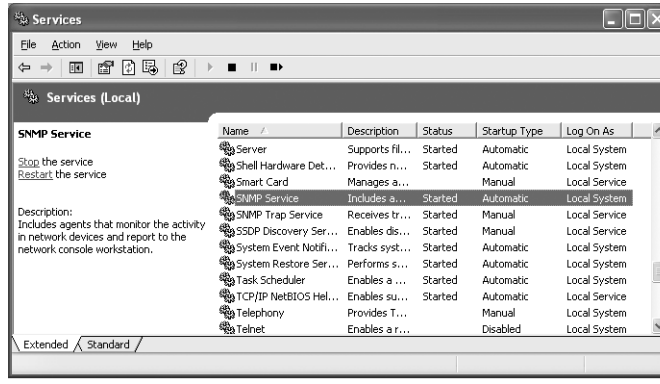
3 Enter security information for identifying community names and hosts allowed to access the display agent (page 109).

4 Restart the SNMP server to activate the changes (page 110).

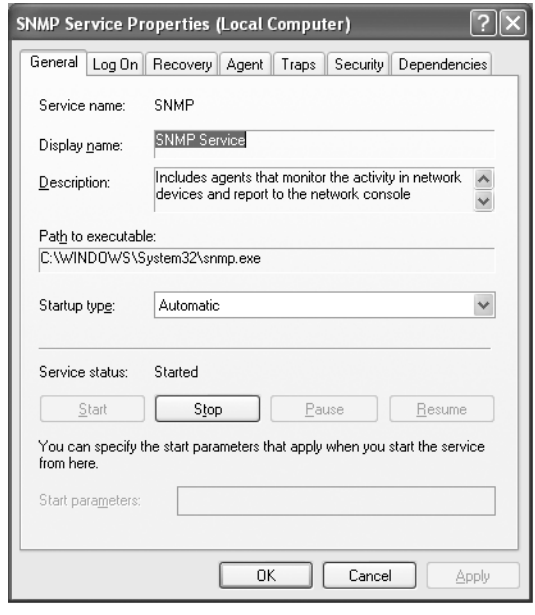
NOTE: The following illustrations show Windows XP dialogs.

To open the Service Properties dialog

1 Open Control Panel > Administrative Tools > Services to see a list of installed services.

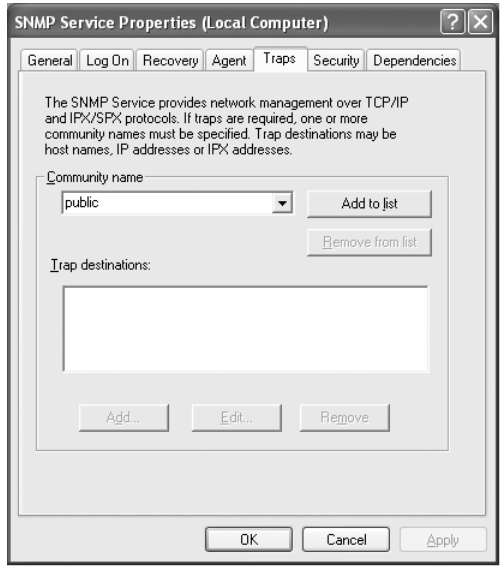

Services
File Action View Help
Services (Local)
SNMP Service
Stop the service
Restart the service
Description:
Includes agents that monitor the activity in network devices and report to the network console workstation.
Name Description Status Startup Type Log On As
Server Supports fil... Started Automatic Local System
Shell Hardware Det... Provides n... Started Automatic Local System
Smart Card Manages a... Manual Local Service
SNMP Service Includes a... Started Automatic Local System
SNMP Trap Service Receives tr... Started Manual Local Service
SSDP Discovery Ser... Enables dis... Started Manual Local Service
System Event Notifi... Tracks syst... Started Automatic Local System
System Restore Ser... Performs s... Started Automatic Local System
Task Scheduler Enables a ... Started Automatic Local System
TCP/IP NetBIOS Hel... Enables su... Started Automatic Local Service
Telephony Provides T... Manual Local System
Telnet Enables a r... Disabled Local System
Extended Standard

2 Right-click the SNMP service name and select Properties on the popup menu to open the General tab of the SNMP Service Properties dialog.


SNMP Service Properties (Local Computer)
General Log On Recovery Agent Traps Security Dependencies
Service name: SNMP
Display name: SNMP Service
Description: Includes agents that monitor the activity in network devices and report to the network console
Path to executable:
C:\WINDOWS\System32\snmp.exe
Startup type: Automatic
Service status: Started
Start Stop Pause Resume
You can specify the start parameters that apply when you start the service from here.
Start parameters:
OK Cancel Apply

To enter traps information

1 Click the Traps tab in the SNMP Service Properties dialog.



2 Create the community name used by the SNMP console application. Type that name in the Community name field then click Add to List. (Dome Dashboard users: Be sure the community name matches the SNMP trap community shown on the Dashboard Edit Workstation dialog > Network Configuration tab.)

3 Create a list of trap destinations. Click Add to open an SNMP Service Configuration dialog.

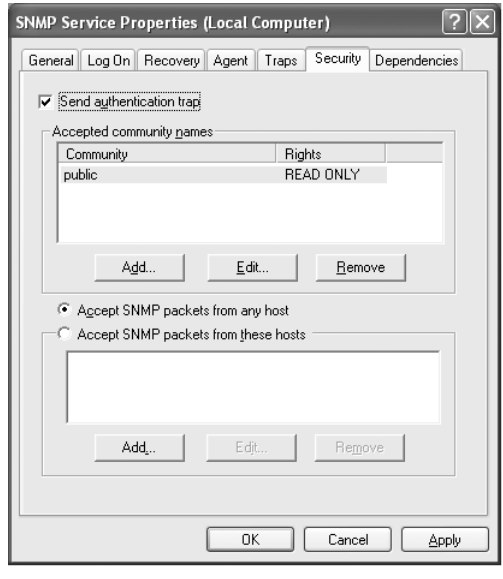
4 Enter information for each destination. (Dome Dashboard users: The host name, IP, or IPX address must match the name of the workstation on which Dome Dashboard is running.)

In most cases you should enter the identifier for the host running your SNMP console application as one list item. You may also run other trap monitoring applications. Dome Dashboard users can define one or more consoles as trap destinations.

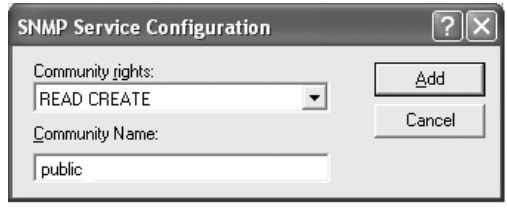
5 Click Apply to save your entries on the Traps tab.

To enter security information

1 Click the Security tab in the SNMP Service Properties dialog. (The accepted community name should match the SNMP communities entered in the Dashboard Edit Workstation dialog > Network Configuration tab.)



2 Click Add in the "Accepted community names" section to open the SNMP Service Configuration dialog.

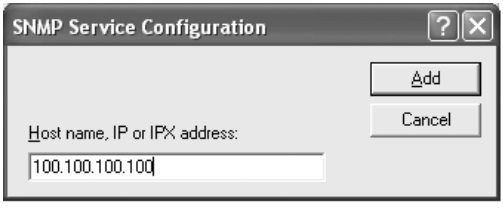


3 Select READ CREATE in the Community rights drop-down list. This allows the Dome Dashboard or SNMP console application to read and set Dome CXtra parameters on this computer.

4 Type the community name used by your SNMP console application in the Community Name field and click Add. (NOTE: You can enter different community names for read, read/write, and read/create, but using the same name is recommended.)

5 Choose either Accept SNMP packets from any host or Accept SNMP packets from these hosts. If you select the latter, then do the following:

Click Add to open an SNMP Service Configuration dialog. Type the host identifier of the computer running your SNMP console application. Click Add.



6 Click OK to close the SNMP Service Properties dialog and save your settings.

NOTE: Dome Dashboard defaults all community names to “public.”

To restart the SNMP service

Right-click the SNMP service name in the Services dialog and select Restart on the pop-up menu.

NOTE: You must restart the SNMP service to activate changes you made using the SNMP Service Properties dialog.

Display Agent Traps

Systems running the Enterprise Management service for Dome CXtra generate only the following traps:

- `trapStatusObserverConnectionFailed`
- `trapStatusChanged`

If the local Dome CXtra system status changes to Warning or Failure, the display agent sends a `trapStatusChanged` trap. For example, if an external application changes the calibration from DICOM Calibration to Original Calibration, the DICal service changes the Dome CXtra system status to Warning and sends the `trapStatusChanged` trap.

To have traps sent when the Dome CXtra system status changes to Success, set `snmpSuccessTraps` to "true" in the `sysDOMEinfo` table.

See the following table of available traps.

Available Traps

Item	Description

`trapStatusObserverConnection-Failed`
Data Items:
`historyStatusStatus,`
`historyStatusRecord,`
`historyStatusServiceTest,`
`historyStatusDateTime,`
`historyStatusSummary`
	Status observer connection failed.

`trapStatusChanged` Data Items:(none)	Status changed.
`trapFPConnectionFailed` (obsolete in version 3.0)	Connection to RightLight service failed.
`trapFPAlert` (obsolete in version 3.0)	Flat-panel white point cannot be achieved.
`trapFPLUMTest` (obsolete in version 3.0)	Flat-panel LUM test failed.
`trapFPWhiteLevelTest` (obsolete in version 3.0)	Flat-panel White Level test failed.
`trapFPAlertEx` (obsolete in version 3.0)	Flat-panel alert.
`trapBacklightSaverConnection-Failed` (obsolete in version 3.0)	Connection to Backlight Saver service failed.

Troubleshooting

Problem	Possible Cause	Solution
Blue screen crashes. Displays dropping out or changing resolution unexpectedly. Dome CXtra not starting properly (such as showing the clock icon continuously).	System instability.	Install the BIOS, firmware, and driver upgrades provided by the manufacturer of your hardware.

Display Assignment. If a different display is selected as the primary, CXtra must be restarted. (NOTE: Applies to all operating systems.)

Fast User Switching. The switching function is not supported on display systems using NVIDIA drivers previous to version 197.03.

Text Size. If text size is changed to 150%, Test Patterns appear fuzzy and too large, due to the client window scaling by Windows. To correct this, after selecting 150% Text size, select Set custom text size (DPI) in the left pane. Then check the Use Windows XP style DPI scaling checkbox, and click OK. (NOTE: Applies to Windows 7 systems only.)

Appendix

Silent Install

The servicesToInstall file specifies which services get installed during a CXtra installation. If this file is present in the same folder as the setup.exe of the CXtra package, any selections or deselections that the user makes with the select/deselect feature will be ignored. Components not listed below are always installed.

Starting with CXtra 6.2.2, SNMP service configuration for Dome Dashboard is supported.

File Syntax

Note the following conditions of operation:

- Lines beginning with a semicolon are ignored.
- Each uncommented line specifies one service that gets installed.
- A comma is the necessary and only allowable delimeter. White spaces at the beginning and end of servicenames, options, option values are ignored.
- Options that need an option value but are specified without one will be ignored.
- An option value must follow its corresponding option. Otherwise, order is unimportant.
- All words are case-insensitive.

Service Format

<servicename>[, <option>[, <option value>]][, <option>[, <option value>]] ...

where <servicename> is one of the following:

BacklightSaver

RightLight

DICal

DIN

TG18

TestPatterns

SNMP

Privilege

Note the following:

WhiteLevelCalibration <will not be installed with Privilege unless explicitly listed>

ManageTestPatterns <will not be installed with testpatterns unless explicitly listed>

If <servicename> is SNMP, the following options are allowed:

<option>	<string value>	<description>
dashboardserver	nameofdashboardserver	Name of IP address of workstation where Dashboard Server is installed
dashboardcommunity	nameofcommunity	Name of dashboard community (optional and default as “public”)

If <servicename> is RightLight, the options shown in the following table are allowed.

<option>	<option value>	<description>
Ambient	low | moderate | high	Sets the quality of ambient brightness
Measurements	<integer> from 5 to 256	Sets the number of measurements during conformance
DynamicRange	equalize | maximize	Sets contrast ratios over time for the luminance of light to dark
Tolerance	<integer> from 0 to 25	Sets the tolerance percentage for white level
TargetWhiteLevel	<integer>	Sets target white level in cd/m^2
DisablePopUps	N/A	Blocks all alert messages
DisableRightLightPopUps	N/A	Blocks only RightLight alert messages

Example #1: Install All Services

BEGIN FILE...
backlightsaver
rightlight
whitelevelcalibration
dical
din
tg18
testpatterns
managetestpatterns
snmp
privilege
...END FILE

Example #2: Install Selected Services

Install TestPatterns, Privilege, SNMP, and RightLight services, setting the number of measurements during conformance, no popups, Dome Dashboard Server and Community, and the ambient brightness:

BEGIN FILE...

rightlight, ambient, low, measurements, 32, dynamicrange, equalize, tolerance, 10, targetwhitelevel, 500, disablepopups, disablerightlightpopups

testpatterns

snmp, dashboardserver, ndsddv2, dashboardcommunity, ddv2community

privilege

...END FILE

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